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Houston, TX (281) 784-5500
Bakersfield, CA (661) 328-1595
New Iberia, LA (337) 364-2322
Anchorage, AK (907) 561-2465

MUDLOG MD

COMPANY ExxonMobil Production
WELL FRU 197-28A8
FIELD FREEDOM CREEK UNIT
REGION ROCKIES
COORDINATES LAT: 39.934571000
LON: 108.295879000
ELEVATION GL = 6082'
KB = 6109'
COUNTY, STATE RIO BLANCO, CO
API INDEX 051031163100
SPUD DATE 05/06/2010
CONTRACTOR HELMRICH AND PAYNE
CO. REP. RICKY T OWENS
RIG/TYPE 215 / FLEX 3
LOGGING UNIT MLU 051
GEOLOGISTS GEORGE BAKER
BRENDA MARSH
ADD. PERSONS BILL JOHANNING
DEVIN CLAAR
CO. GEOLOGIST MELAINE A. BIGGS

LOG INTERVAL

CASING DATA

DEPTHS: 3,441' TO 12,275'
DATES: 5/04/2010 TO 5/23/2010
SCALE: 5" = 100'

16.0" AT 119'
10.75" AT 3,441'
AT
AT

MUD TYPES

HOLE SIZE

LSND TO 12,275'
TO
TO
TO
TO

14.75" TO 3,441'
8.75" TO 12,275'
TO
TO

ABBREVIATIONS

NB NEWBIT PV PLASTIC VISCOSITY LC LOST CIRCULATION
RRB RERUN BIT YP YIELD POINT CO CIRCULATE OUT
CB CORE BIT FL FLUID LOSS NR NO RETURNS
WOB WEIGHT ON BIT CL PPM CLORIDE ION TG TRIP GAS
RPM ROTARY REV/MIN Rm MUD RESISTIVITY SG SURVEY GAS
PP PUMP PRESSURE Rmf FILTRATE RESISTIVITY WG WIPER GAS
SPM STROKES/MIN PR POOR RETURNS CG CONNECTION GAS
MW MUD WEIGHT LAT LOGGED AFTER TRIP
VIS FUNNEL VISCOSITY LAS LOGGED AFTER SURVEY

Legend of geological symbols and patterns including: ALTERED ZONE, ANDESITE, ANHYDRITE, BASALT, BENTONITE, BIOTITIZATION, BRECCIA, CALCARENITE, CALCAREOUS TUFF, CALCILUTITE, CARBONATES, CARBONACEOUS MAT, CARBONACEOUS SH, CEMENT CONTAM., CHALK, CRYSTALLINE TUFF, CHERT - ARGILL, CHERT - GLASSY, CHERT - PORCEL, CHERT - TIGER STRIPE, CHERT - UNDIFF, CLAY, CLAY-MUDSTONE, CLYST-TUFFACEOUS, CHLORITIZATION, COAL, CONGLOMERATE, CONGL. SAND, CONGL. SANDSTONE, COQUINA, DACITE, DIATOMITE, DIORITE, DOLOSTONE, FELSIC SILIC DIKE, FOSSIL, GABBRO, GLASSY TUFF, GRANITE, GRANITE WASH, GRANODIORITE, GYPSUM, HALITE, HORNBL-QTZ-DIO, IGNEOUS (ACIDIC), IGNEOUS (BASIC), INTRUSIVES, KAOLINITE, LIMESTONE, LITHIC TUFF, MARL - DOLO, MARL - CALC, METAMORPHICS, MUDSTONE, OBSIDIAN, PALEOSOL, PHOSPHATE, PORCELANITE, PORCELANEOUS CLYST, PYRITE, PYROCLASTICS, QUARTZ DIORITE, QUARTZ LATITE, QUARTZ MONZONITE, RECRYSTALLIZED CALCITE, RHYOLITE, SAND, SANDSTONE, SANDSTONE-TUFFACEOUS, SERICITIZATION, SERPENTINE, SHALE, SHALE TUFFACEOUS, SHELL FRAGMENTS, SIDERITE, SILICIFICATION, SILTSTONE, SILTST-TUFFACEOUS, TUFF, VOLCANICLASTICS SEDS, VOLCANICS.

<100	ROP	0>
ft/hr		
<50	Avg WOB	0>
klbs		

Depth

Lithology

MGS	<0	Ttl Gas units	500>	<10	Meth C-1 ppm	100K>
	<0	CO2 ppm	100K>	<10	Ethn C-2	100K>
	<0	Flare Ht. ft	100>	<10	Prop C-3	100K>
	<0			<10	Butn C-4	100K>
				<10	Pent C-5	100K>

Interp. Lith

Remarks
Survey Data, Mud Reports, Other Info.

3300

ALL ROCK COLORS ARE REFERENCED TO THE
GSA ROCK COLOR CHART, ROCK CONSTITUENTS
ARE DESCRIBED WET AND LISTED IN ORDER OF
MOST ABUNDANT TO LEAST ABUNDANT, ALL
SAMPLE DEPTHS ARE REFERENCED TO RKB.
GAS CHROMATOGRAPHY EQUIPMENT IS
CALIBRATED TO A TEST GAS COMPOSED OF
METHANE = 10000 PPM
ETHANE = 1000 PPM
PROPANE = 1000 PPM
I-BUTANE = 1000 PPM
N- BUTANE = 1000 PPM
I- PENTANE = 1000 PPM
N- PENTANE = 1000 PPM

NB3 2, 8.75" @ 3441'

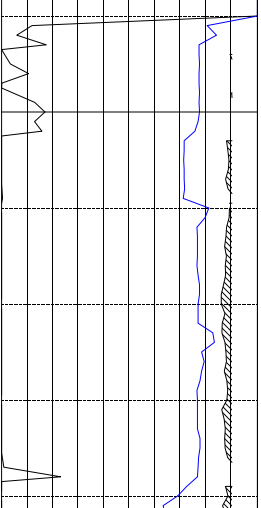
3400

Hughes Q504X w/ 4-12 2-13's

13.5 Hrs, 979'

C-1

CO2 IS CALIBRATED TO A TEST GAS COMPOSED OF 100000 PPM



3500

<100 ROP

<50 Avg WOB

Ttl Gas 100<10 Meth C-1 100K<

<0 CO2 100K<10 Ethn C-2 100K<

<0 Flare Ht. 100<10 Prop C-3 100K<

<10 Burn C-4 100K<
MW 8.10 FV 37 PV 8 YF 7

<10 Pent C-5 100K<
API FIL 17.2 GELS 2/5/11 Ph 11.5

CL- 1500 Ca+ 60 MTB 17.0 SOL

24 HRS LOSSES 18.2 bbls

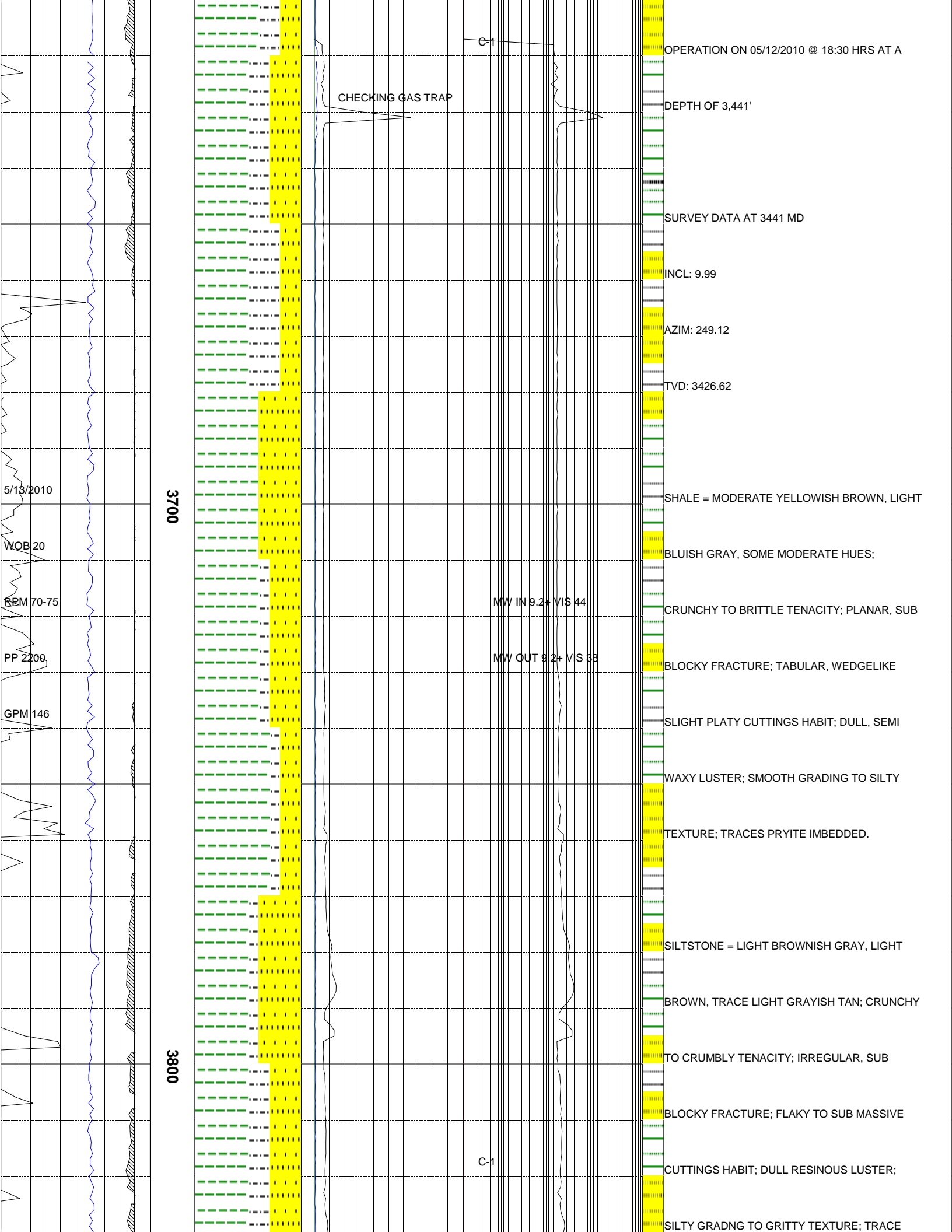
3600

CONNECTION GAS, TRIP GAS, AND WIPER GAS ARE NOTED ON THE MUDLOG, FLARE HEIGHTS AND DEPTHS OF GAS BUSTER USAGE ARE ALSO NOTED.

EARLY CONNECTION GASES REPRESENTING UP HOLE GAS INTERVALS BLEEDING INTO THE BOREHOLE ARE COMMON IN THE PRODUCTION INTERVAL.

EVIDENCE OF FRACTURE FILL IS NOTED ON THE LOG USING THE LITHOLOGY SYMBOL FOR METAMORPHICS. THE 10% DOES NOT REPRESENT 10% FRACTURE FILL IN SAMPLE. IT ONLY INDICATES THAT FRACTURE FILL HAS BEEN OBSERVED OVER THE INTERVAL.

CANRIG WELL SERVICE COMMENCED LOGGING



OPERATION ON 05/12/2010 @ 18:30 HRS AT A

DEPTH OF 3,441'

SURVEY DATA AT 3441 MD

INCL: 9.99

AZIM: 249.12

TVD: 3426.62

3700

SHALE = MODERATE YELLOWISH BROWN, LIGHT

BLUISH GRAY, SOME MODERATE HUES;

CRUNCHY TO BRITTLE TENACITY; PLANAR, SUB

BLOCKY FRACTURE; TABULAR, WEDGELIKE

SLIGHT PLATY CUTTINGS HABIT; DULL, SEMI

WAXY LUSTER; SMOOTH GRADING TO SILTY

TEXTURE; TRACES PRYITE IMBEDDED.

SILTSTONE = LIGHT BROWNISH GRAY, LIGHT

BROWN, TRACE LIGHT GRAYISH TAN; CRUNCHY

TO CRUMBLY TENACITY; IRREGULAR, SUB

BLOCKY FRACTURE; FLAKY TO SUB MASSIVE

CUTTINGS HABIT; DULL RESINOUS LUSTER;

SILTY GRADNG TO GRITTY TEXTURE; TRACE

CHECKING GAS TRAP

C-1

MW IN 9.2+ VIS 44

MW OUT 9.2+ VIS 38

C-1

5/13/2010

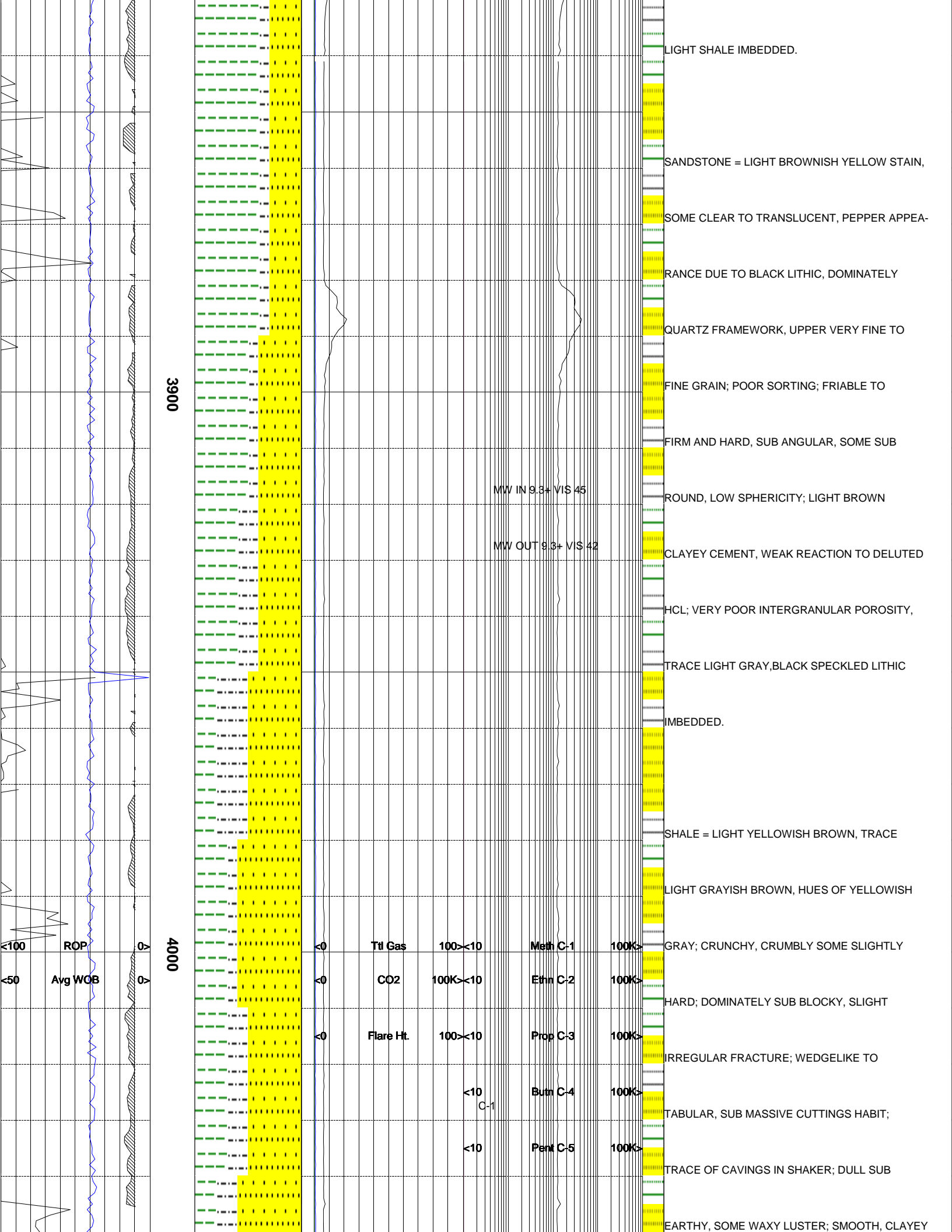
WOB 20

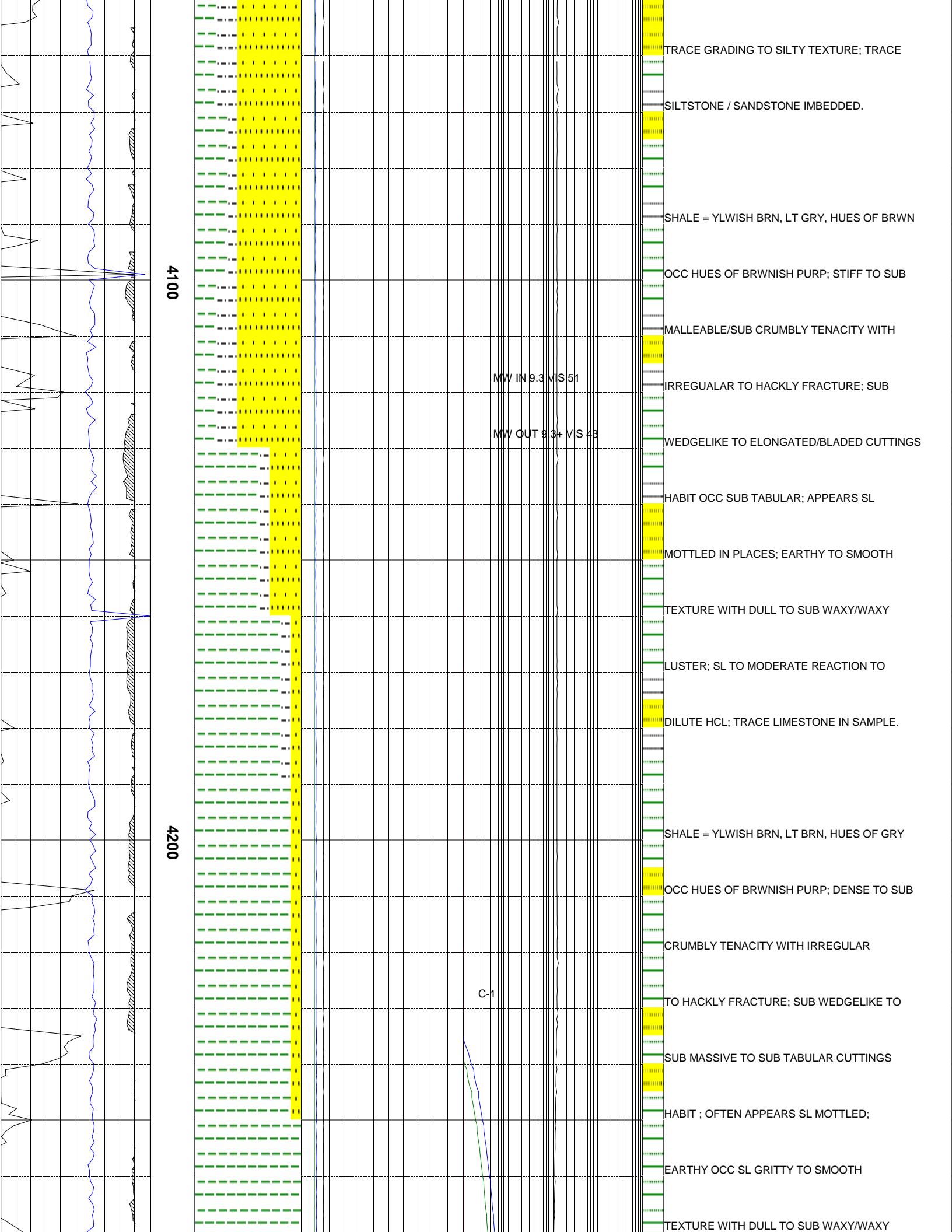
RPM 70-75

PP 2200

GPM 146

3800





4100

4200

TRACE GRADING TO SILTY TEXTURE; TRACE

SILTSTONE / SANDSTONE IMBEDDED.

SHALE = YLWISH BRN, LT GRY, HUES OF BRWN

OCC HUES OF BRWNISH PURP; STIFF TO SUB

MALLEABLE/SUB CRUMBLY TENACITY WITH

MW IN 9.3 VIS 51

IRREGULAR TO HACKLY FRACTURE; SUB

MW OUT 9.3+ VIS 43

WEDGELIKE TO ELONGATED/BLADED CUTTINGS

HABIT OCC SUB TABULAR; APPEARS SL

MOTTLED IN PLACES; EARTHY TO SMOOTH

TEXTURE WITH DULL TO SUB WAXY/WAXY

LUSTER; SL TO MODERATE REACTION TO

DILUTE HCL; TRACE LIMESTONE IN SAMPLE.

SHALE = YLWISH BRN, LT BRN, HUES OF GRY

OCC HUES OF BRWNISH PURP; DENSE TO SUB

CRUMBLY TENACITY WITH IRREGULAR

C-1

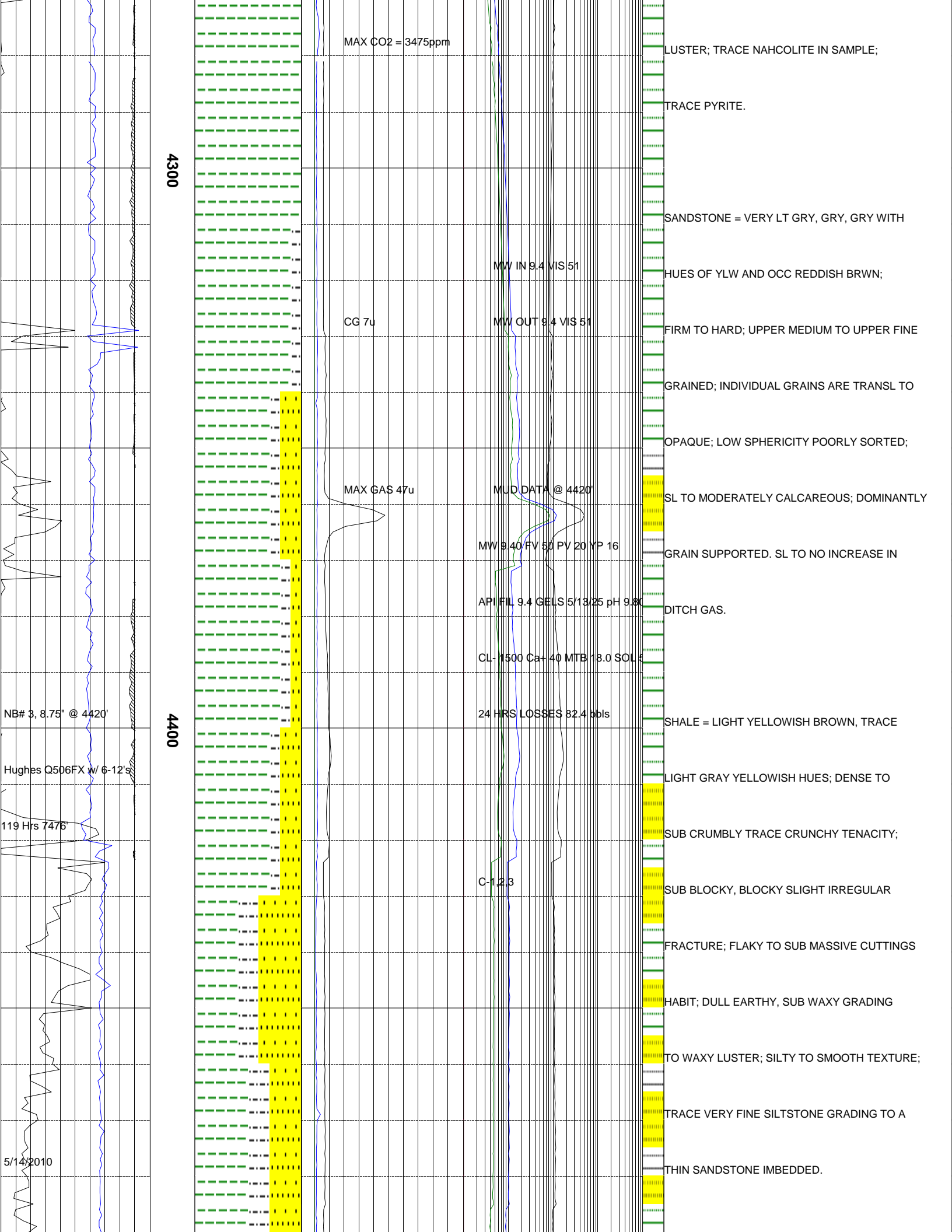
TO HACKLY FRACTURE; SUB WEDGELIKE TO

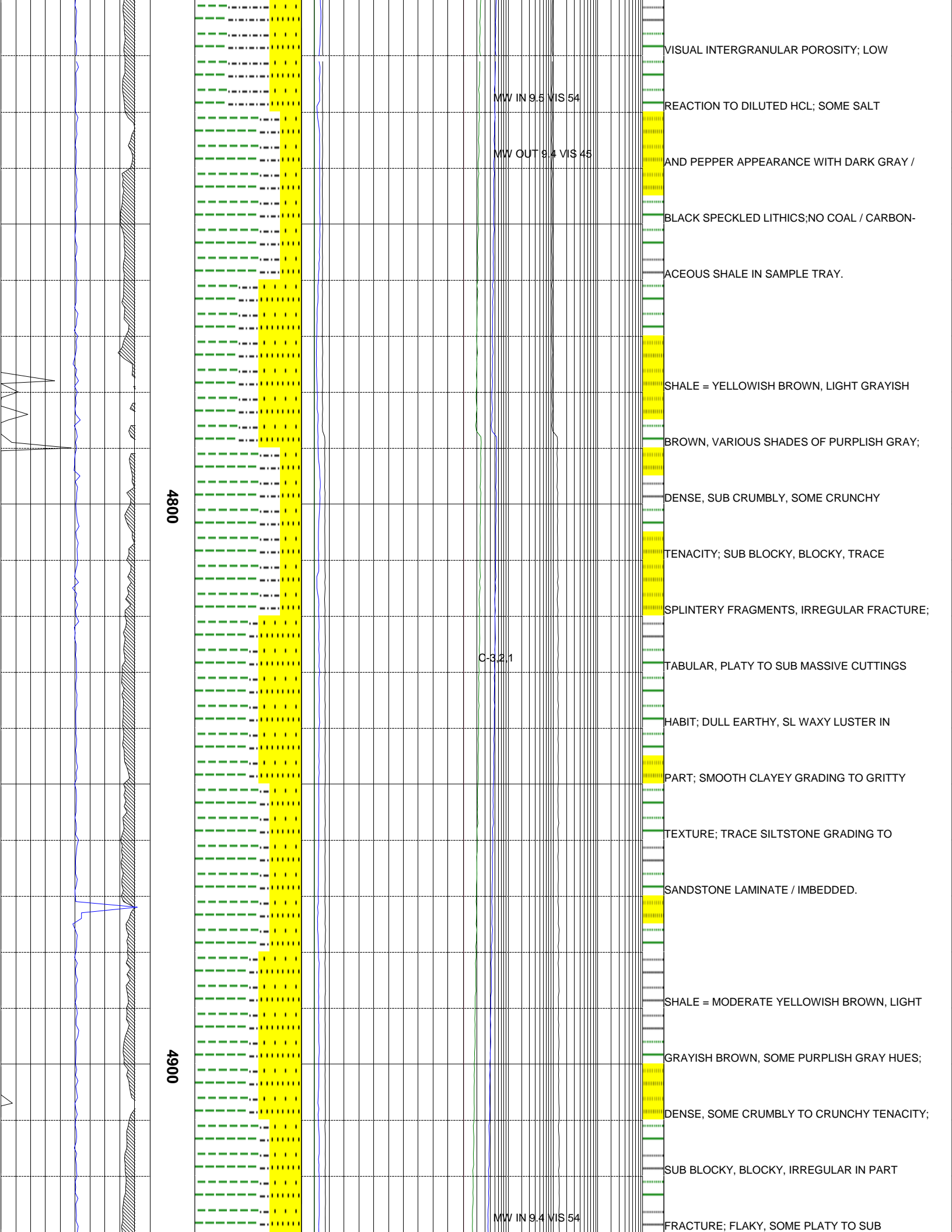
SUB MASSIVE TO SUB TABULAR CUTTINGS

HABIT ; OFTEN APPEARS SL MOTTLED;

EARTHY OCC SL GRITTY TO SMOOTH

TEXTURE WITH DULL TO SUB WAXY/WAXY





MW IN 9.5 VIS 54

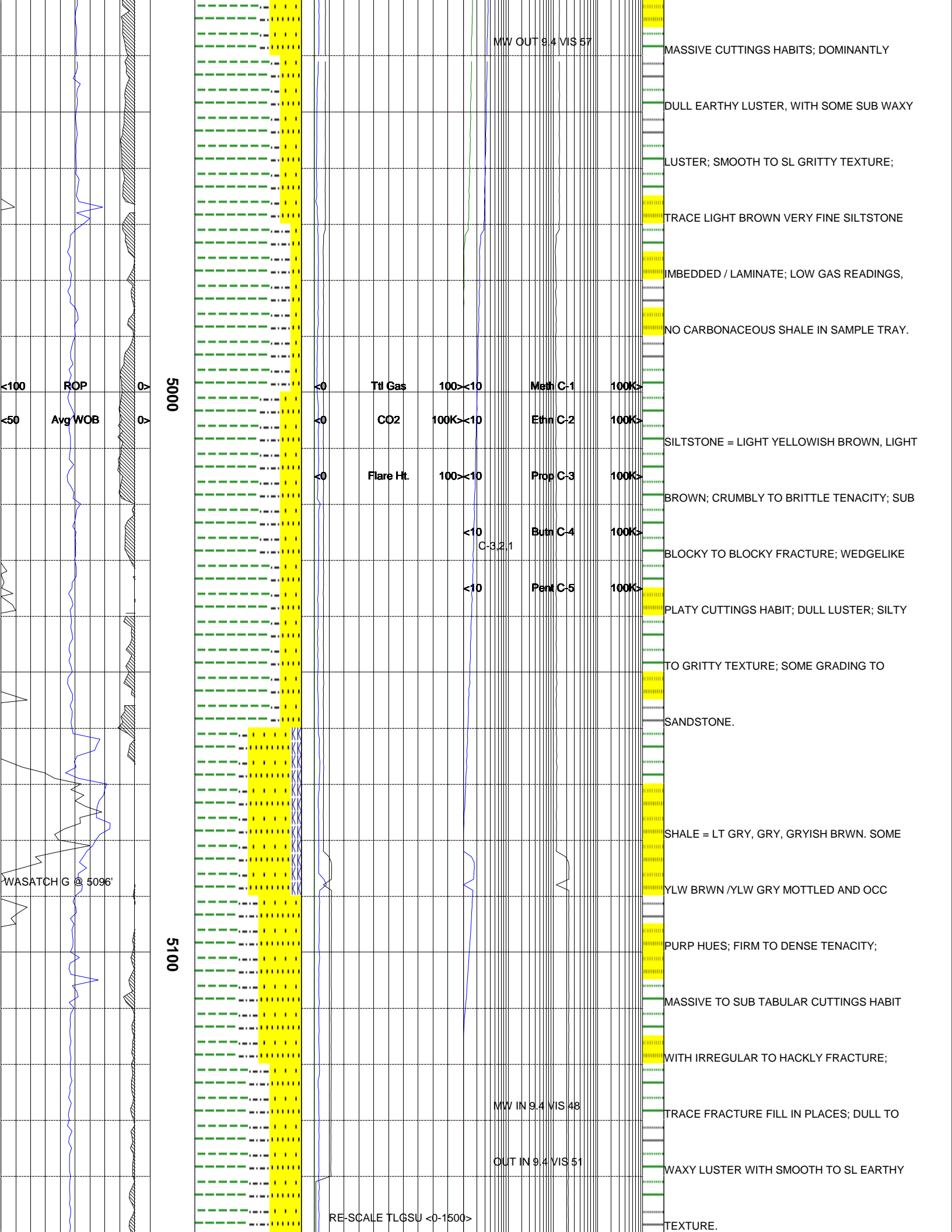
MW OUT 9.4 VIS 45

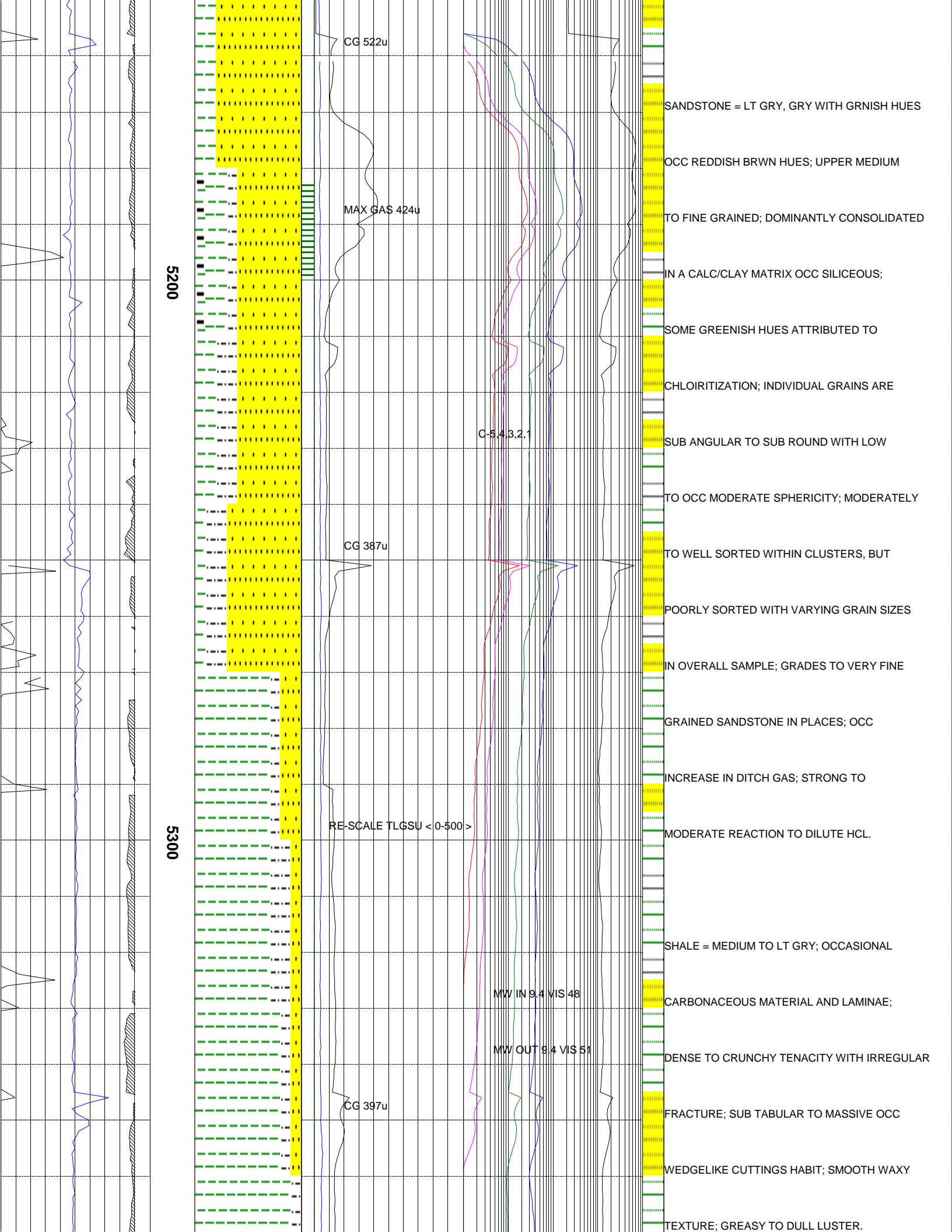
C-321

MW IN 9.4 VIS 54

4800

4900





5200

5300

CG 522u

MAX GAS 424u

CG 387u

RE-SCALE TLGSU < 0-500 >

CG 397u

C-543.2.1

MW IN 9.4 VIS 48

MW OUT 9.4 VIS 51

SANDSTONE = LT GRY, GRY WITH GRNISH HUES

OCC REDDISH BRWN HUES; UPPER MEDIUM

TO FINE GRAINED; DOMINANTLY CONSOLIDATED

IN A CALC/CLAY MATRIX OCC SILICEOUS;

SOME GREENISH HUES ATTRIBUTED TO

CHLORITIZATION; INDIVIDUAL GRAINS ARE

SUB ANGULAR TO SUB ROUND WITH LOW

TO OCC MODERATE SPHERICITY; MODERATELY

TO WELL SORTED WITHIN CLUSTERS, BUT

POORLY SORTED WITH VARYING GRAIN SIZES

IN OVERALL SAMPLE; GRADES TO VERY FINE

GRAINED SANDSTONE IN PLACES; OCC

INCREASE IN DITCH GAS; STRONG TO

MODERATE REACTION TO DILUTE HCL.

SHALE = MEDIUM TO LT GRY; OCCASIONAL

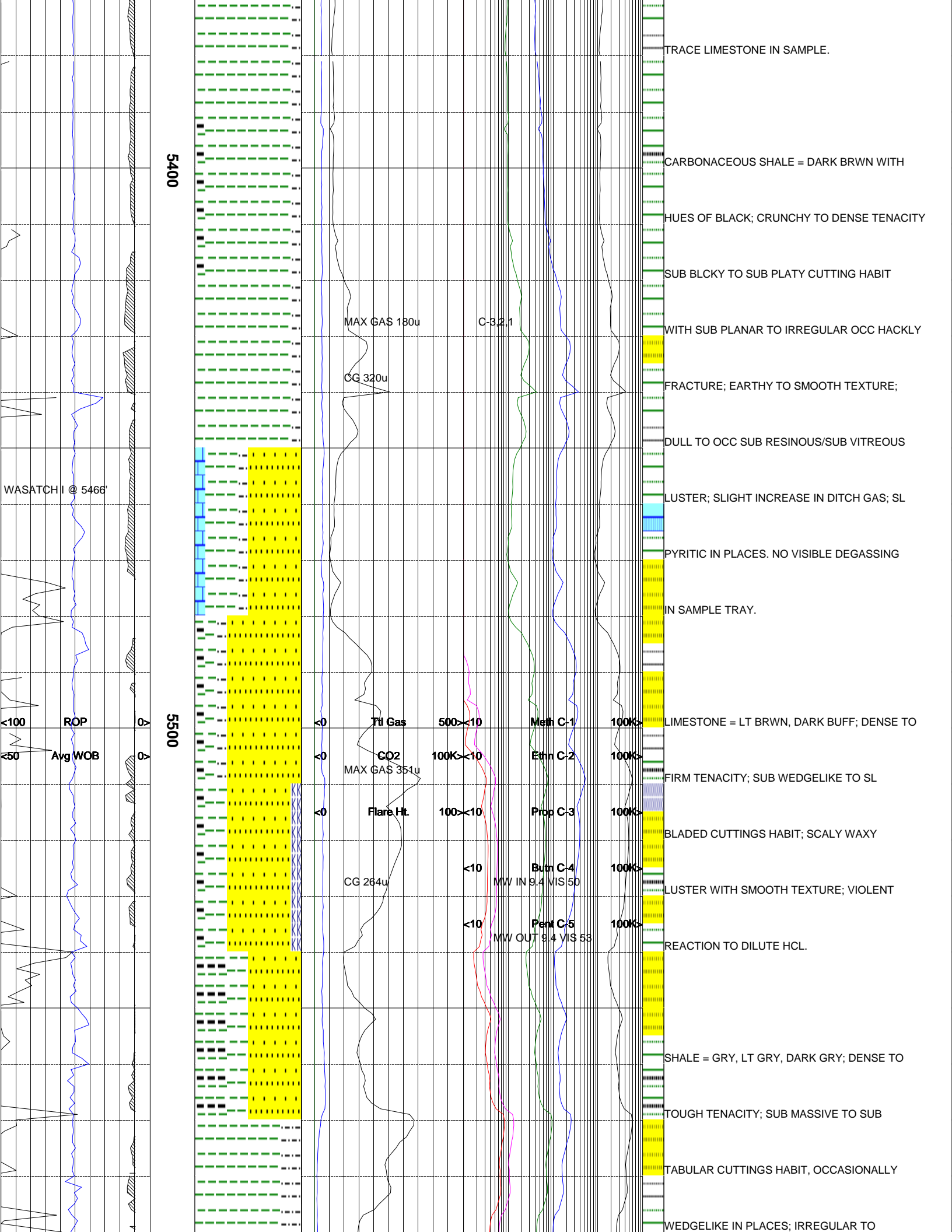
CARBONACEOUS MATERIAL AND LAMINAE;

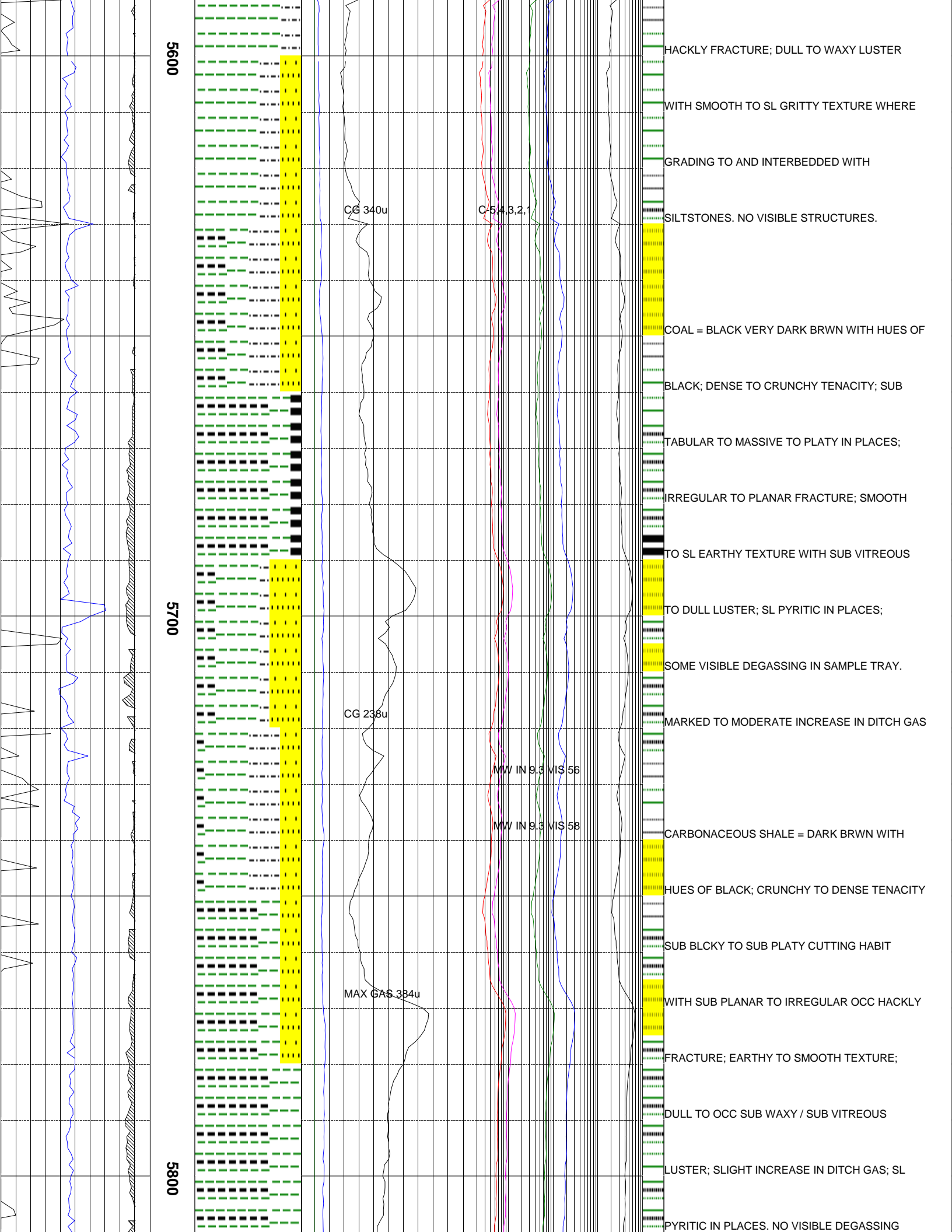
DENSE TO CRUNCHY TENACITY WITH IRREGULAR

FRACTURE; SUB TABULAR TO MASSIVE OCC

WEDGELIKE CUTTINGS HABIT; SMOOTH WAXY

TEXTURE; GREASY TO DULL LUSTER.





5600

HACKLY FRACTURE; DULL TO WAXY LUSTER
WITH SMOOTH TO SL GRITTY TEXTURE WHERE
GRADING TO AND INTERBEDDED WITH
SILTSTONES. NO VISIBLE STRUCTURES.

CG 340u

C-5443.2.1

COAL = BLACK VERY DARK BRWN WITH HUES OF
BLACK; DENSE TO CRUNCHY TENACITY; SUB
TABULAR TO MASSIVE TO PLATY IN PLACES;
IRREGULAR TO PLANAR FRACTURE; SMOOTH
TO SL EARTHY TEXTURE WITH SUB VITREOUS

5700

TO DULL LUSTER; SL PYRITIC IN PLACES;
SOME VISIBLE DEGASSING IN SAMPLE TRAY.
MARKED TO MODERATE INCREASE IN DITCH GAS

CG 238u

MW IN 9.3 VIS 56

MW IN 9.3 VIS 58

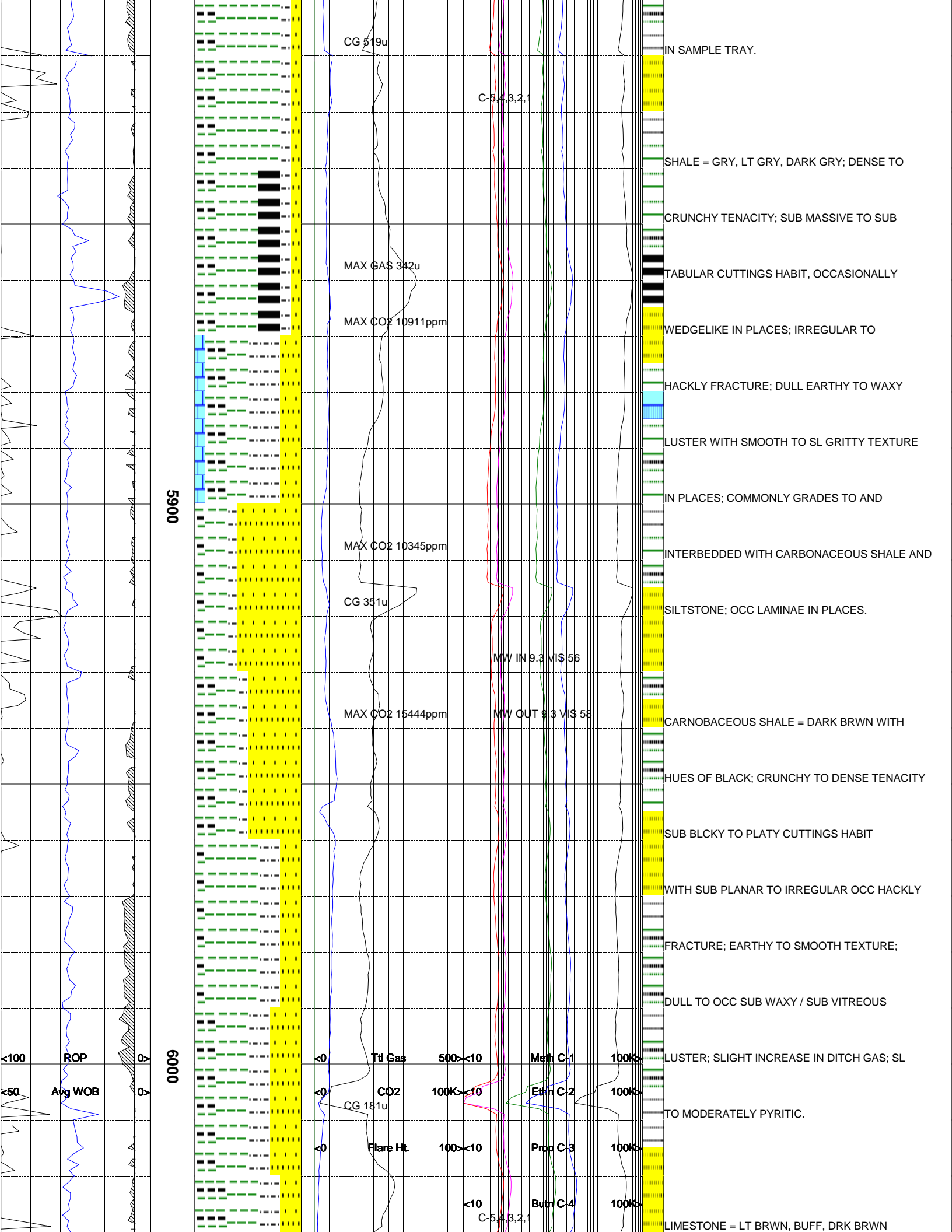
CARBONACEOUS SHALE = DARK BRWN WITH
HUES OF BLACK; CRUNCHY TO DENSE TENACITY
SUB BLCY TO SUB PLATY CUTTING HABIT

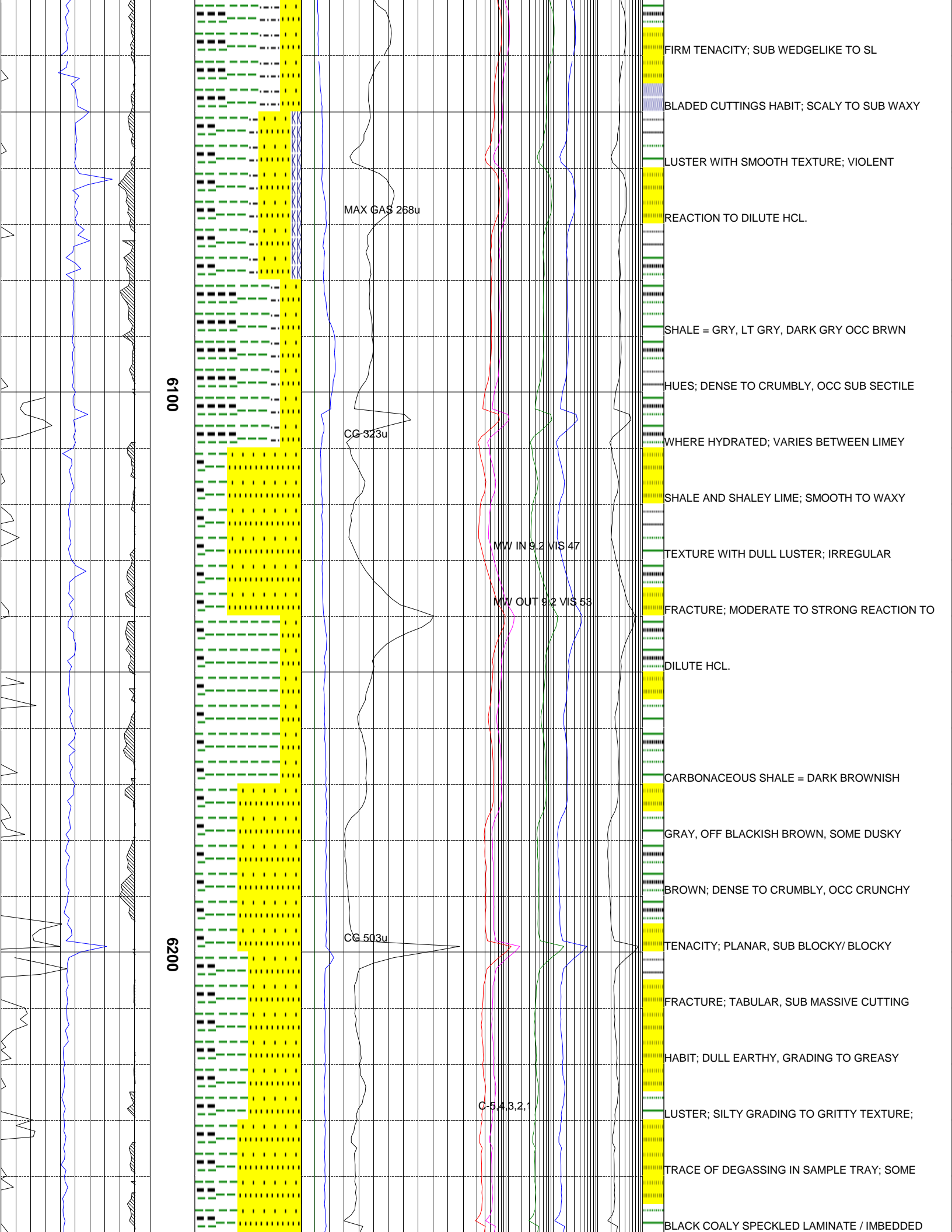
MAX GAS 384u

WITH SUB PLANAR TO IRREGULAR OCC HACKLY
FRACTURE; EARTHY TO SMOOTH TEXTURE;
DULL TO OCC SUB WAXY / SUB VITREOUS

5800

LUSTER; SLIGHT INCREASE IN DITCH GAS; SL
PYRITIC IN PLACES. NO VISIBLE DEGASSING





6100

6200

MAX GAS 268u

CG 323u

MW IN 9.2 VIS 47

MW OUT 9.2 VIS 53

CG 503u

C-543.2.1

FIRM TENACITY; SUB WEDGELIKE TO SL

BLADED CUTTINGS HABIT; SCALY TO SUB WAXY

LUSTER WITH SMOOTH TEXTURE; VIOLENT

REACTION TO DILUTE HCL.

SHALE = GRY, LT GRY, DARK GRY OCC BRWN

HUES; DENSE TO CRUMBLY, OCC SUB SECTILE

WHERE HYDRATED; VARIES BETWEEN LIMEY

SHALE AND SHALEY LIME; SMOOTH TO WAXY

TEXTURE WITH DULL LUSTER; IRREGULAR

FRACTURE; MODERATE TO STRONG REACTION TO

DILUTE HCL.

CARBONACEOUS SHALE = DARK BROWNISH

GRAY, OFF BLACKISH BROWN, SOME DUSKY

BROWN; DENSE TO CRUMBLY, OCC CRUNCHY

TENACITY; PLANAR, SUB BLOCKY/ BLOCKY

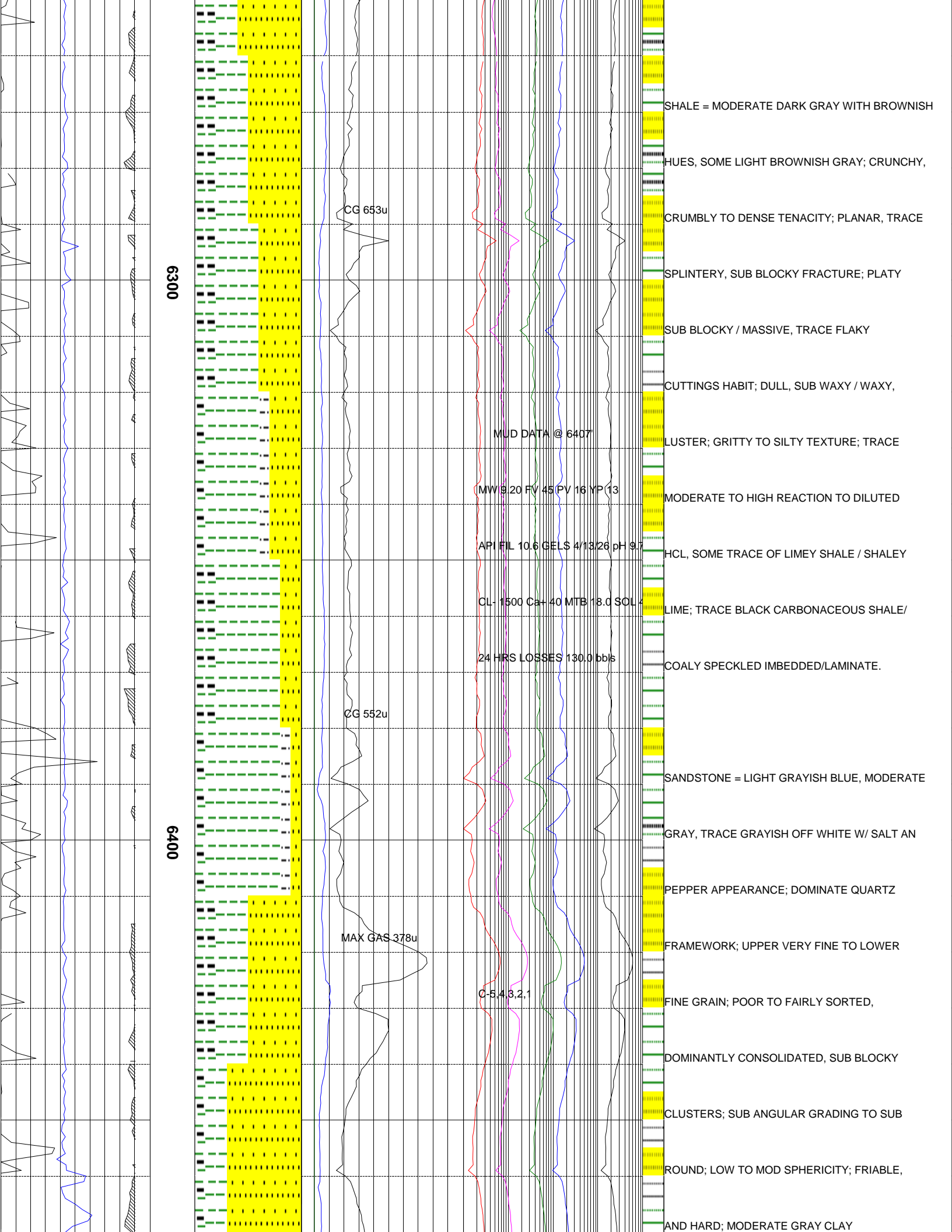
FRACTURE; TABULAR, SUB MASSIVE CUTTING

HABIT; DULL EARTHY, GRADING TO GREASY

LUSTER; SILTY GRADING TO GRITTY TEXTURE;

TRACE OF DEGASSING IN SAMPLE TRAY; SOME

BLACK COALY SPECKLED LAMINATE / IMBEDDED



6300

6400

CG 653u

CG 552u

MAX GAS 378u

MUD DATA @ 6407

MW 9.20 FV 45 PV 16 YP 13

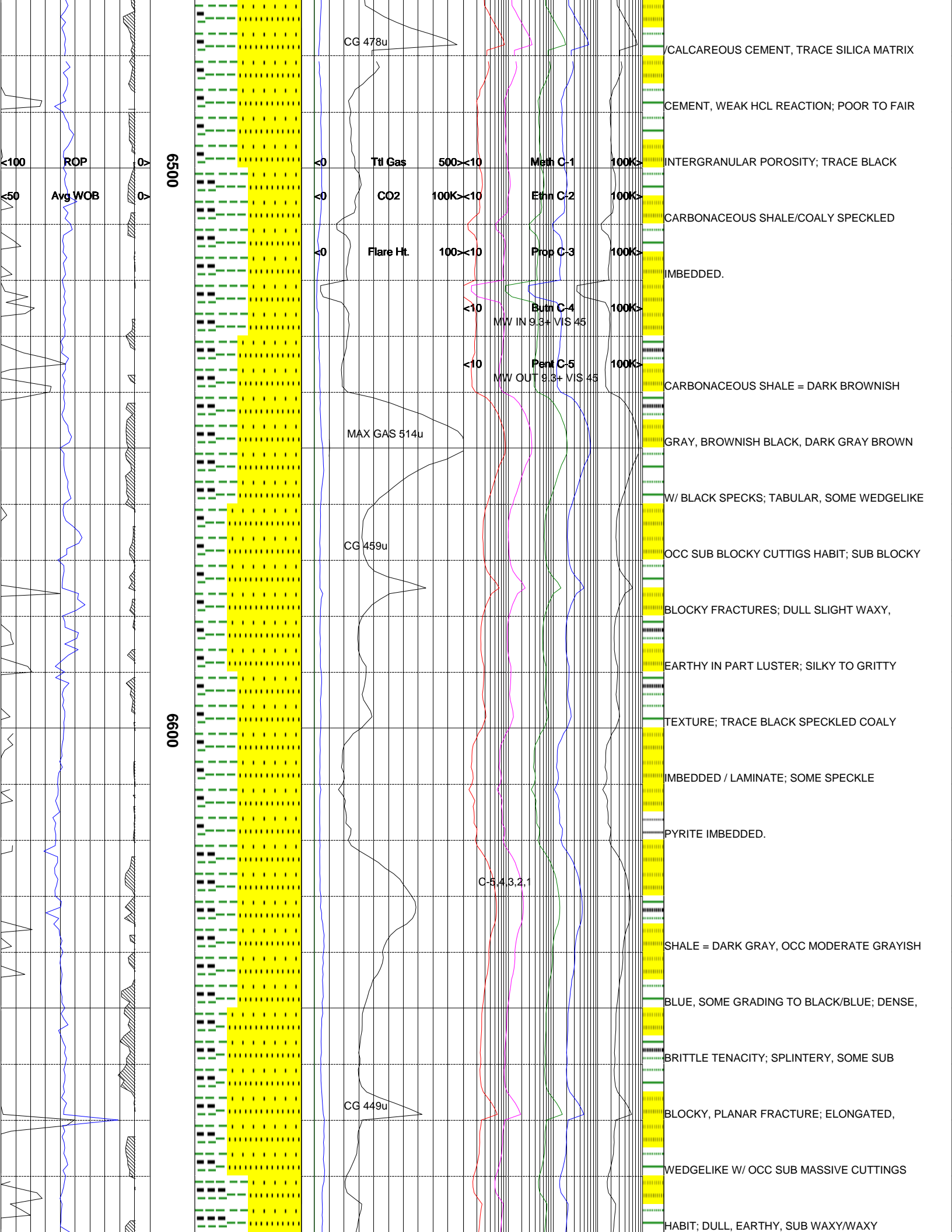
API FIL 10.6 GELS 4/13 26 pH 9.7

CL- 1500 Ca+ 40 MTB 18.0 SOL 4

24 HRS LOSSES 130.0 bbis

C-5.43.2.1

SHALE = MODERATE DARK GRAY WITH BROWNISH HUES, SOME LIGHT BROWNISH GRAY; CRUNCHY, CRUMBLY TO DENSE TENACITY; PLANAR, TRACE SPLINTERY, SUB BLOCKY FRACTURE; PLATY SUB BLOCKY / MASSIVE, TRACE FLAKY CUTTINGS HABIT; DULL, SUB WAXY / WAXY, LUSTER; GRITTY TO SILTY TEXTURE; TRACE MODERATE TO HIGH REACTION TO DILUTED HCL, SOME TRACE OF LIMEY SHALE / SHALEY LIME; TRACE BLACK CARBONACEOUS SHALE/ COALY SPECKLED IMBEDDED/LAMINATE. SANDSTONE = LIGHT GRAYISH BLUE, MODERATE GRAY, TRACE GRAYISH OFF WHITE W/ SALT AN PEPPER APPEARANCE; DOMINATE QUARTZ FRAMEWORK; UPPER VERY FINE TO LOWER FINE GRAIN; POOR TO FAIRLY SORTED, DOMINANTLY CONSOLIDATED, SUB BLOCKY CLUSTERS; SUB ANGULAR GRADING TO SUB ROUND; LOW TO MOD SPHERICITY; FRIABLE, AND HARD; MODERATE GRAY CLAY



6500

6600

<100 ROP
<50 Avg WOB

CG 478u

Ttl Gas 500<10 Meth C-1 100K>

CO2 100K<10 Ethn C-2 100K>

Flare Ht. 100>10 Prop C-3 100K>

<10 Burn C-4 100K>
MW IN 9.3+ VIS 45

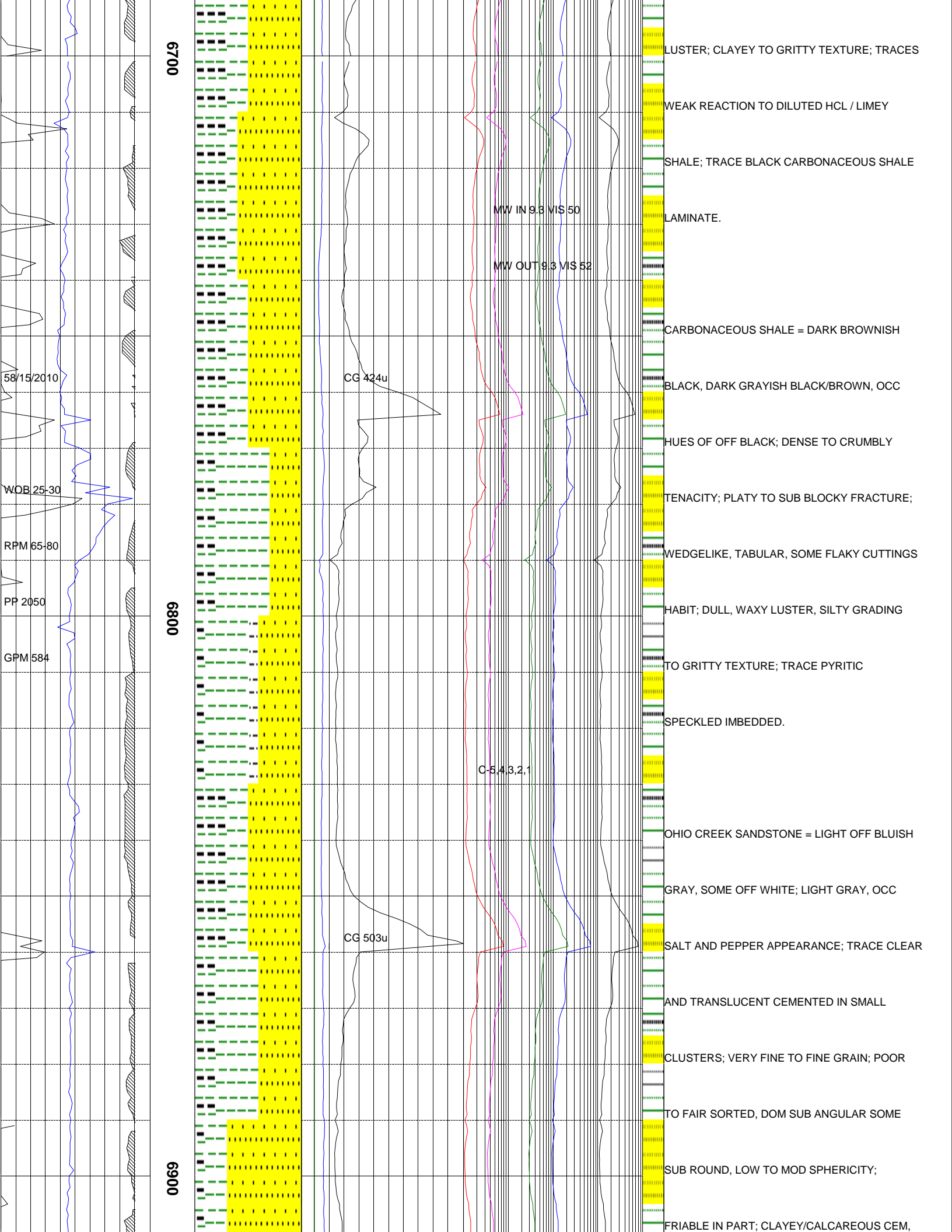
<10 Pent C-5 100K>
MW OUT 9.3+ VIS 45

MAX GAS 514u

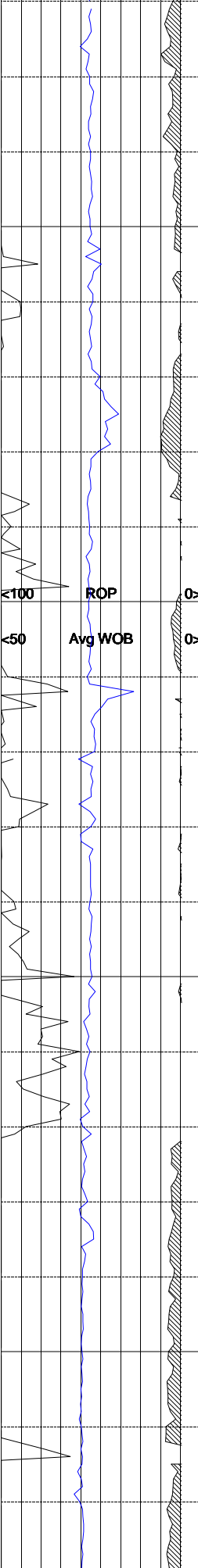
CG 459u

C-5.43.2.1

CG 449u

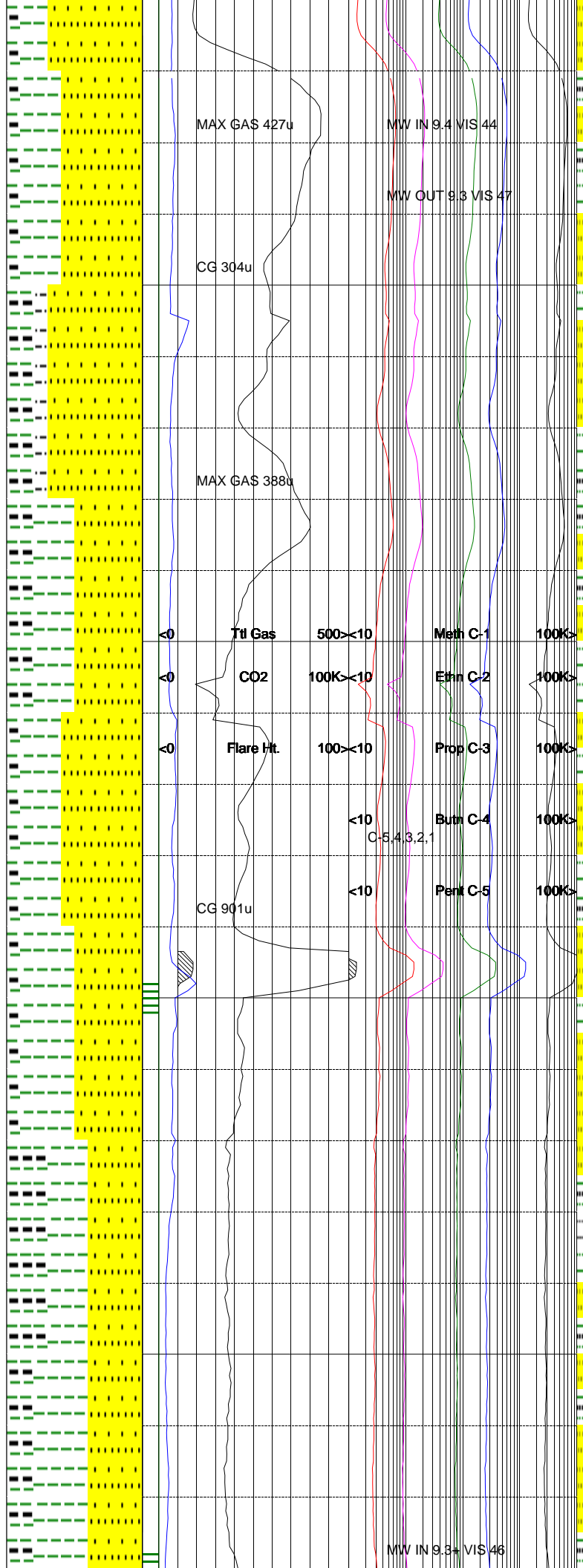


OHIO CREEK @ 6908'



7000

7100



SOME SILICA MATRIX CEMENT, LOW REACTION
 TO HCL. SPECKLED DARK LITHIC AND MAFIC
 IMBEDDED.
 SANDSTONE = LIGHT BLuish GRAY, CLEAR
 TO TRANSLUCENT, SUB BLOCKY CLUSTERS,
 SALT AND PEPPER APPEARANCE, VERY FINE
 GRADING TO FINE GRAIN; POOR TO FAIR SORT
 ING; DOM SUB ANGULAR / SOME SUB ROUND,
 LOW TO MOD SPHERICITY; FRIABLE IN PART;
 CLAYEY/SILICA MATRIX CEMENT, SOME
 CALCAREOUS CEMENT, MOD HCL REACTION;
 SPECKLED LITHIC/ MAFIC AND CARBONACEOUS
 SHALE IMBEDDED.
 SANDSTONE = LIGHT OFF WHITE/GRAY, TRACE
 BLuish GRAY, SOME CLEAR TO TRANSLUCENT
 GRAINS, FEW LOOSE GRAINS, OCC SALT AND
 PEPPER APPEARANCE; QUARTZ FRAMEWORK;
 FAIR SORTED; DOMINANTLY SUB ANGULAR,
 UPPER VERY FINE TO LOWER FINE GRAIN; LOW
 TO MODERATE SPHERICITY; FRIABLE TO HARD;

MAX GAS 427u

MW IN 9.4 VIS 44

MW OUT 9.3 VIS 47

CG 304u

MAX GAS 388u

Ttl Gas

Meth C-1

CO2

Ethn C-2

Flare Ht.

Prop C-3

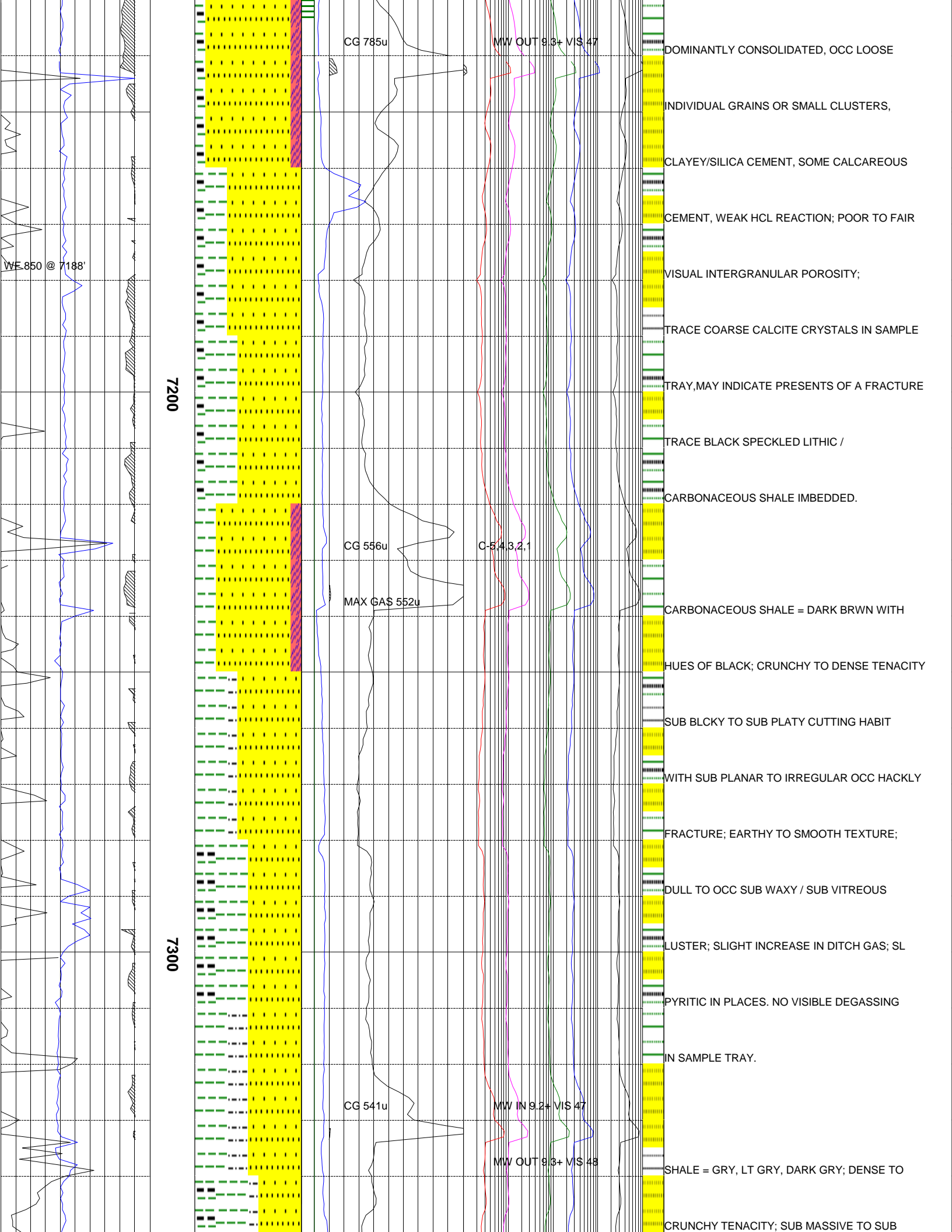
Butn C-4

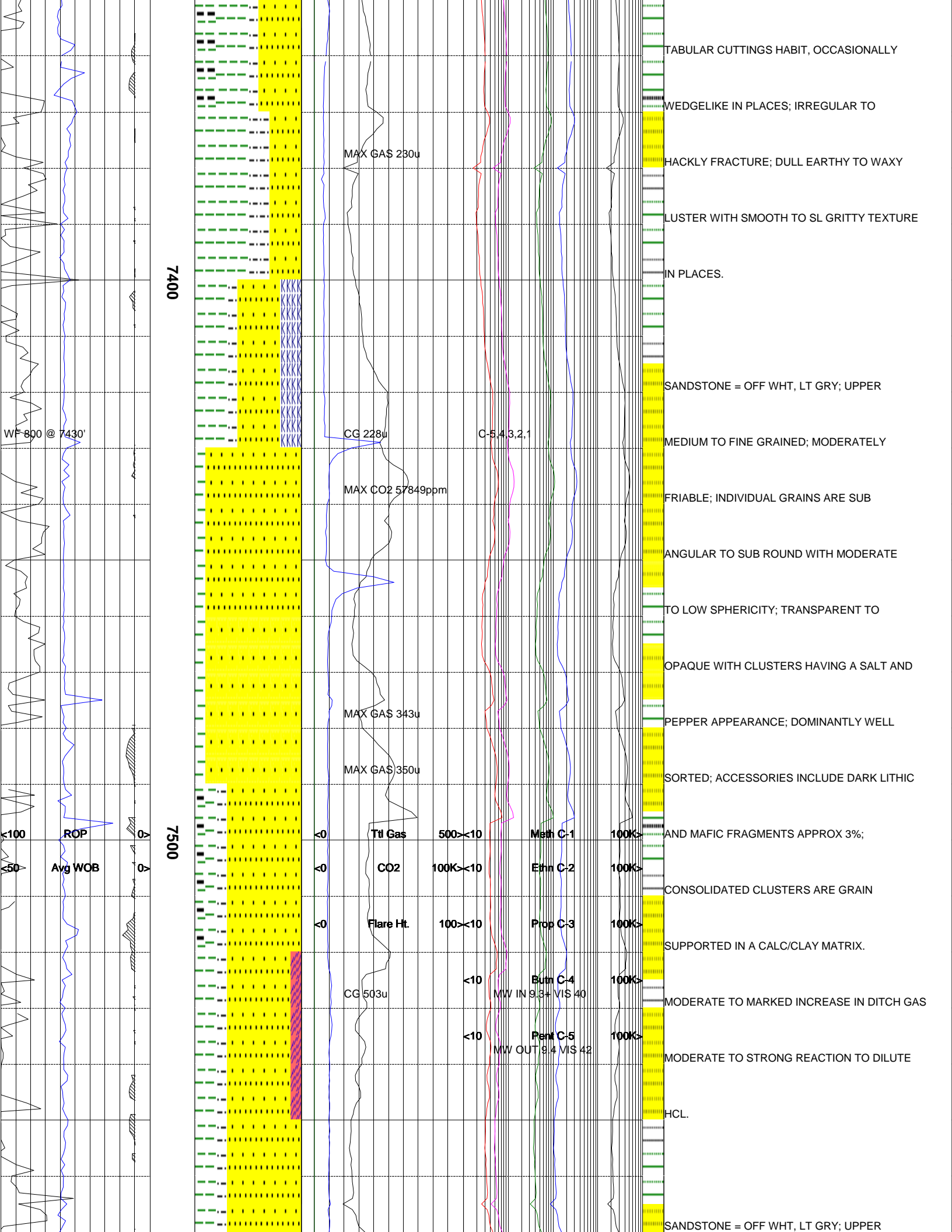
CG 901u

Pent C-5

C-5,4,3,2,1

MW IN 9.3+ VIS 46





7400

7500

WF 800 @ 7430'

MAX GAS 230u

CG 228u

MAX CO2 57849ppm

MAX GAS 343u

MAX GAS 350u

Ttl Gas

CO2

Flare Ht.

CG 503u

500 < 10

100K < 10

100 < 10

< 10

< 10

Meth C-1

Ethn C-2

Prop C-3

Burn C-4

Pent C-5

100K >

100K >

100K >

100K >

100K >

C-5.4 3.2, 1

MW IN 9.3+ VIS 40

MW OUT 9.4 VIS 42

TABULAR CUTTINGS HABIT, OCCASIONALLY

WEDGELIKE IN PLACES; IRREGULAR TO

HACKLY FRACTURE; DULL EARTHY TO WAXY

LUSTER WITH SMOOTH TO SL GRITTY TEXTURE

IN PLACES.

SANDSTONE = OFF WHT, LT GRY; UPPER

MEDIUM TO FINE GRAINED; MODERATELY

FRIABLE; INDIVIDUAL GRAINS ARE SUB

ANGULAR TO SUB ROUND WITH MODERATE

TO LOW SPHERICITY; TRANSPARENT TO

OPAQUE WITH CLUSTERS HAVING A SALT AND

PEPPER APPEARANCE; DOMINANTLY WELL

SORTED; ACCESSORIES INCLUDE DARK LITHIC

AND MAFIC FRAGMENTS APPROX 3%;

CONSOLIDATED CLUSTERS ARE GRAIN

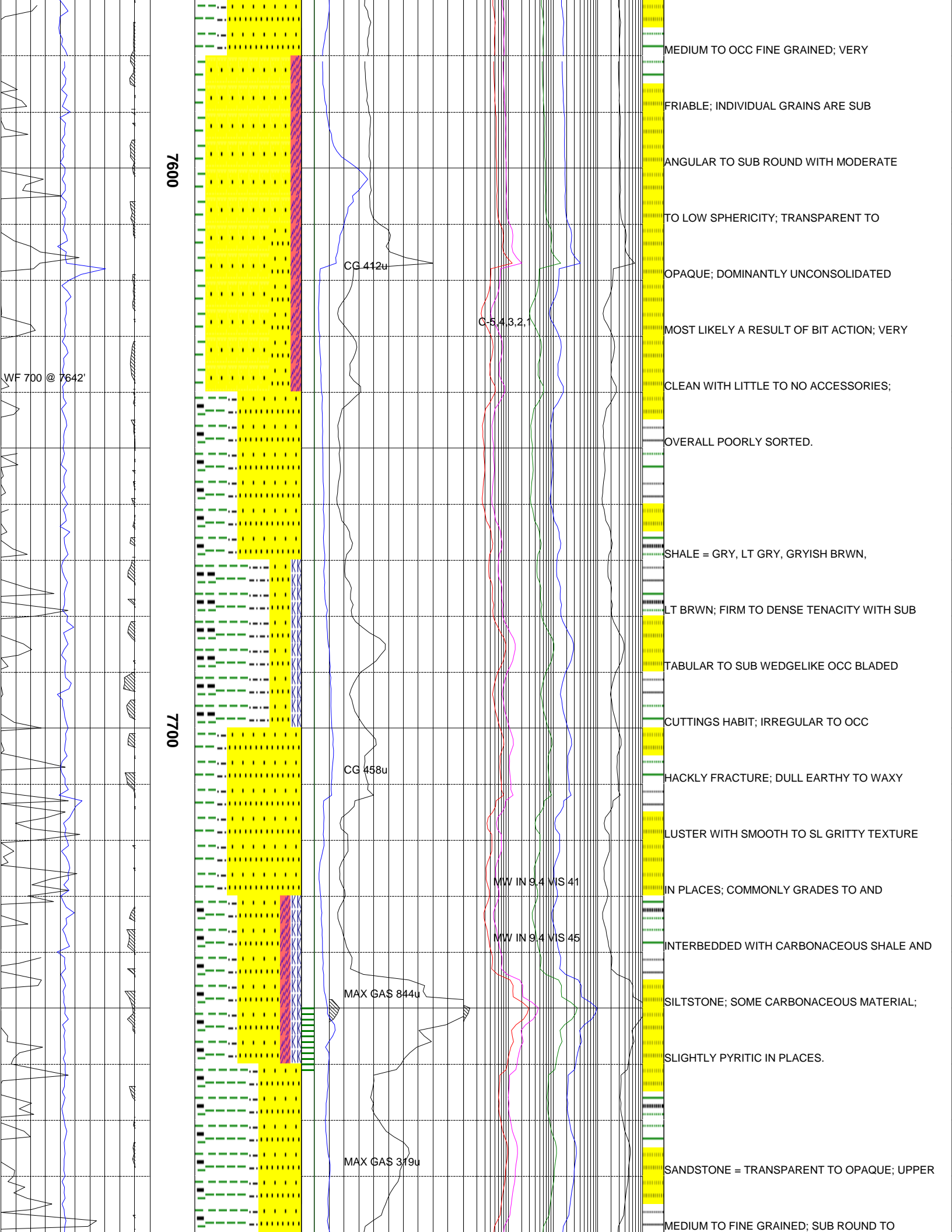
SUPPORTED IN A CALC/CLAY MATRIX.

MODERATE TO MARKED INCREASE IN DITCH GAS

MODERATE TO STRONG REACTION TO DILUTE

HCL.

SANDSTONE = OFF WHT, LT GRY; UPPER



7600

7700

WF 700 @ 7642'

CG 412u

C-543.2.1

CG 458u

MW IN 9.4 VIS 41

MW IN 9.4 VIS 45

MAX GAS 844u

MAX GAS 319u

MEDIUM TO OCC FINE GRAINED; VERY

FRIABLE; INDIVIDUAL GRAINS ARE SUB

ANGULAR TO SUB ROUND WITH MODERATE

TO LOW SPHERICITY; TRANSPARENT TO

OPAQUE; DOMINANTLY UNCONSOLIDATED

MOST LIKELY A RESULT OF BIT ACTION; VERY

CLEAN WITH LITTLE TO NO ACCESSORIES;

OVERALL POORLY SORTED.

SHALE = GRY, LT GRY, GRYISH BRWN,

LT BRWN; FIRM TO DENSE TENACITY WITH SUB

TABULAR TO SUB WEDGELIKE OCC BLADED

CUTTINGS HABIT; IRREGULAR TO OCC

HACKLY FRACTURE; DULL EARTHY TO WAXY

LUSTER WITH SMOOTH TO SL GRITTY TEXTURE

IN PLACES; COMMONLY GRADES TO AND

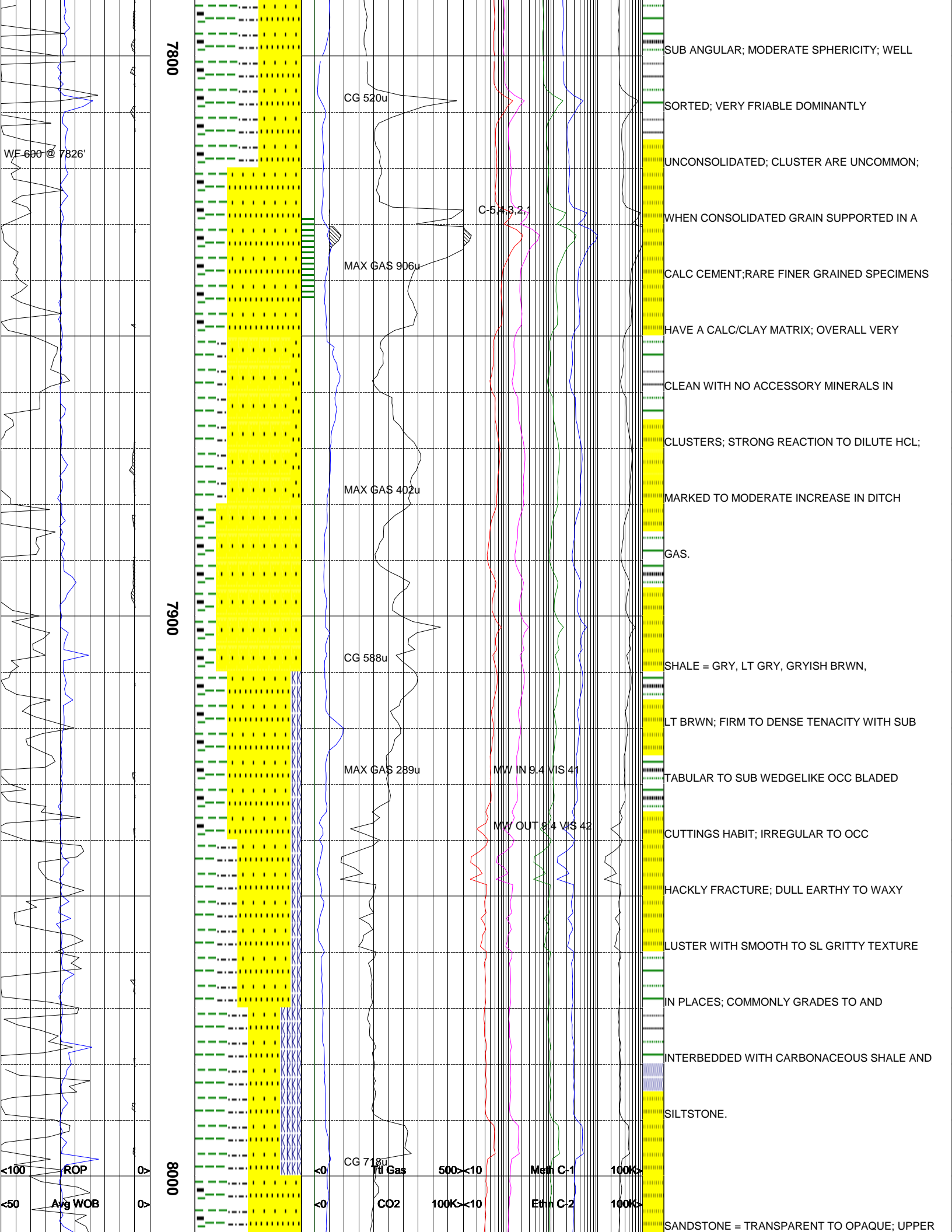
INTERBEDDED WITH CARBONACEOUS SHALE AND

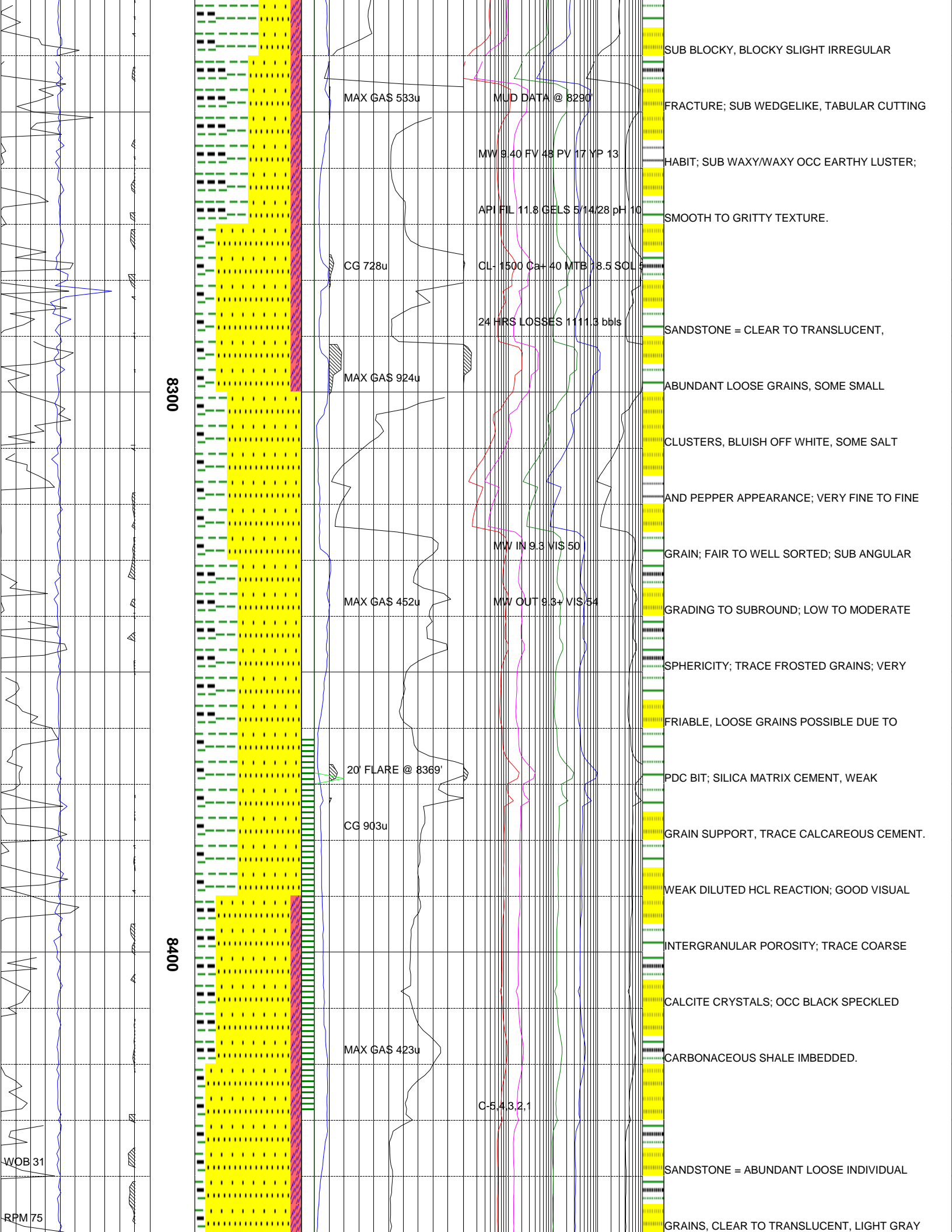
SILTSTONE; SOME CARBONACEOUS MATERIAL;

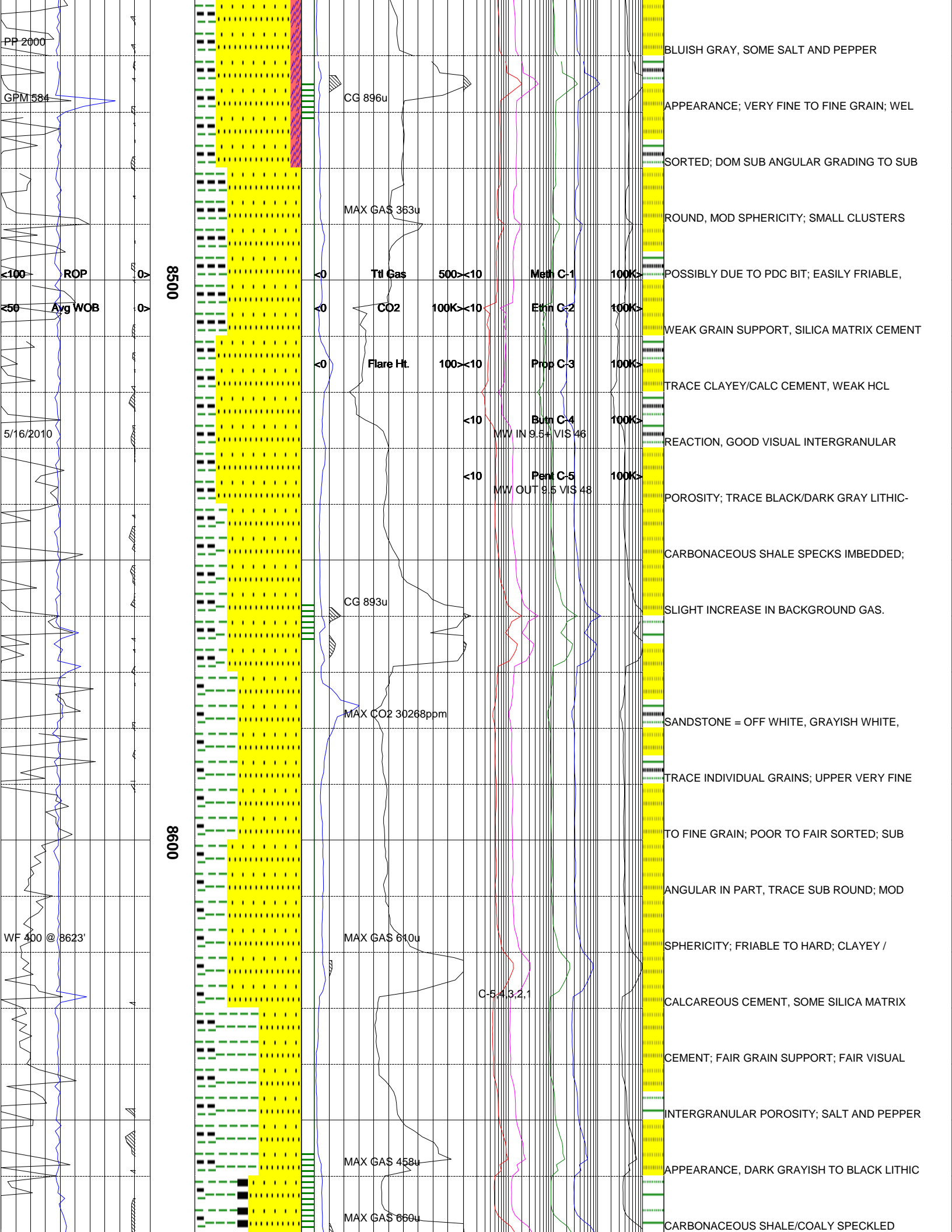
SLIGHTLY PYRITIC IN PLACES.

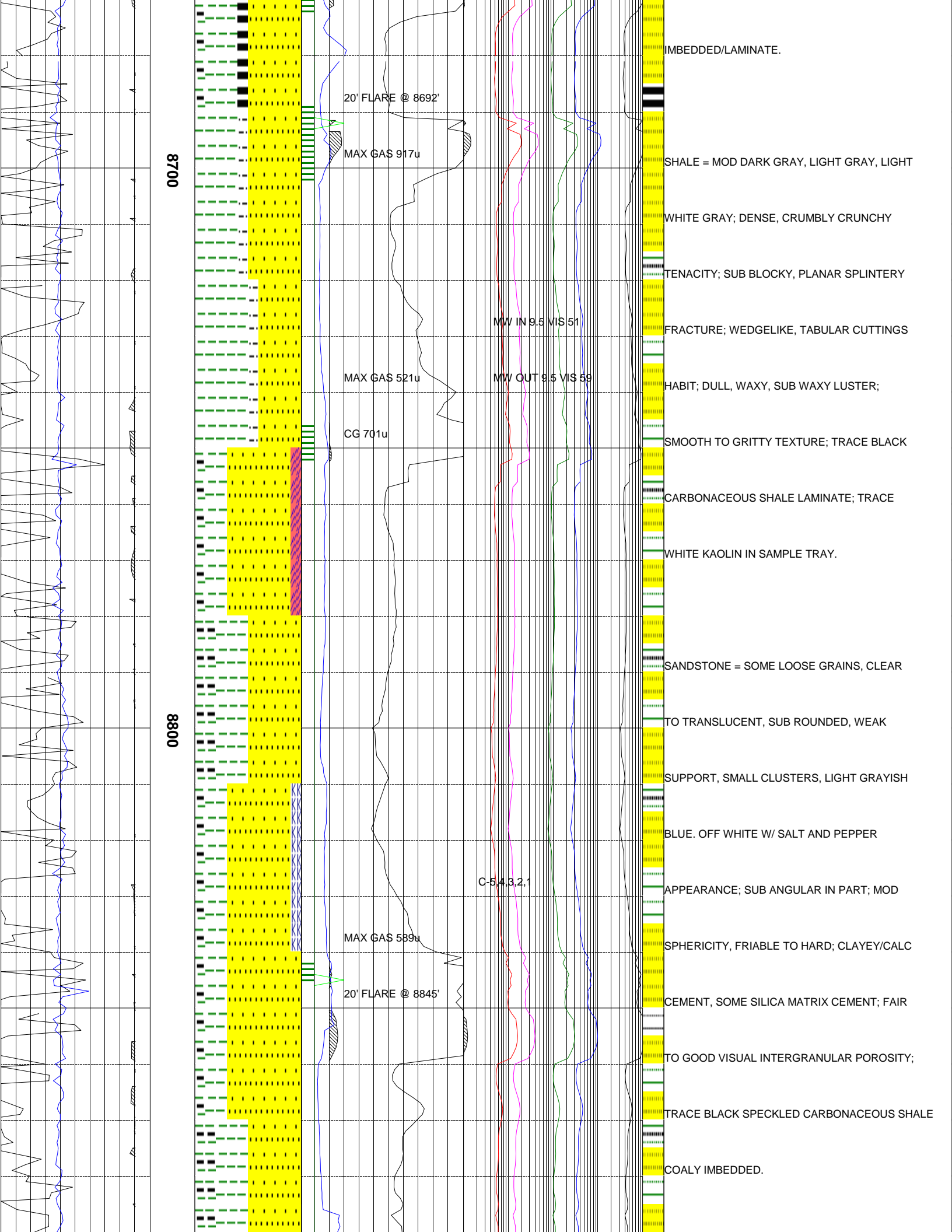
SANDSTONE = TRANSPARENT TO OPAQUE; UPPER

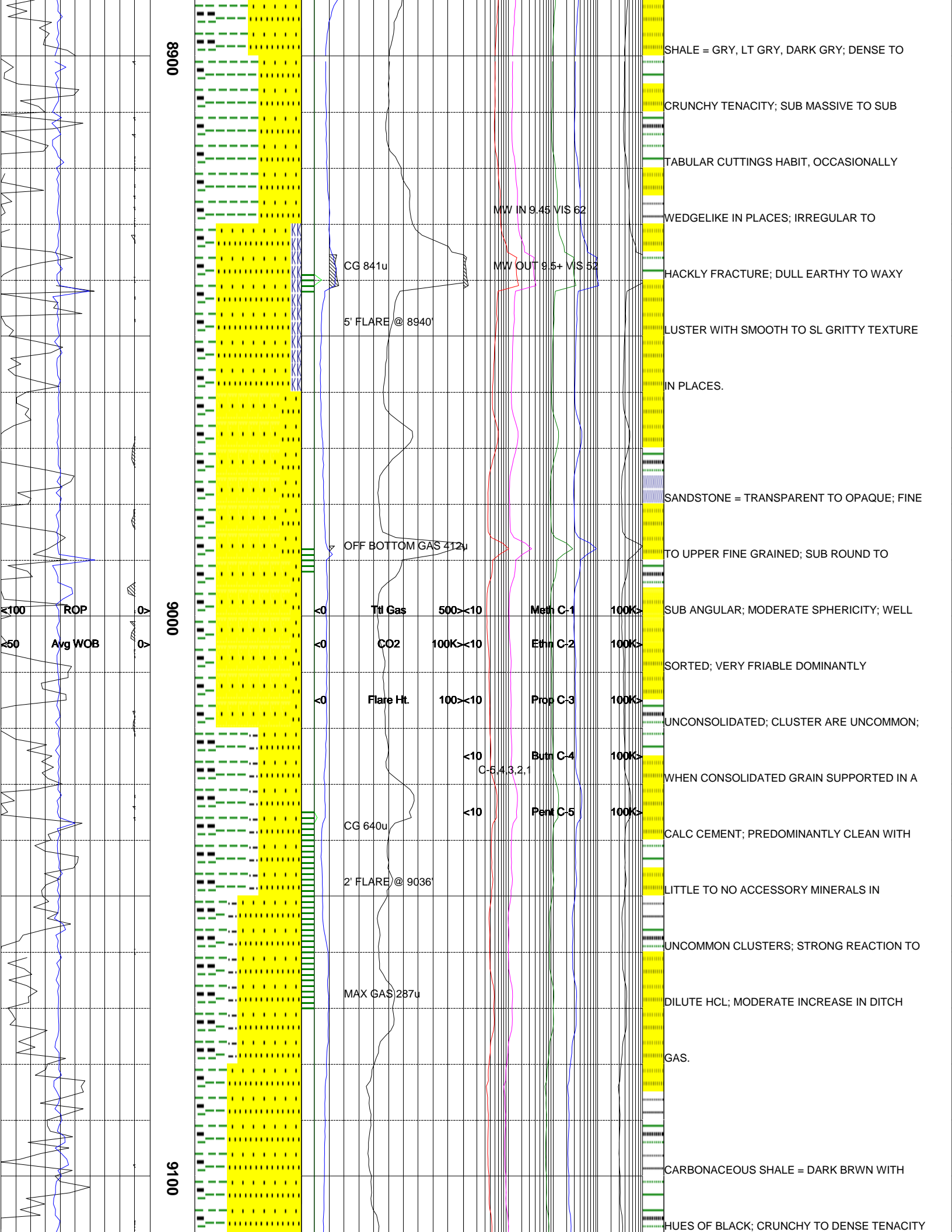
MEDIUM TO FINE GRAINED; SUB ROUND TO

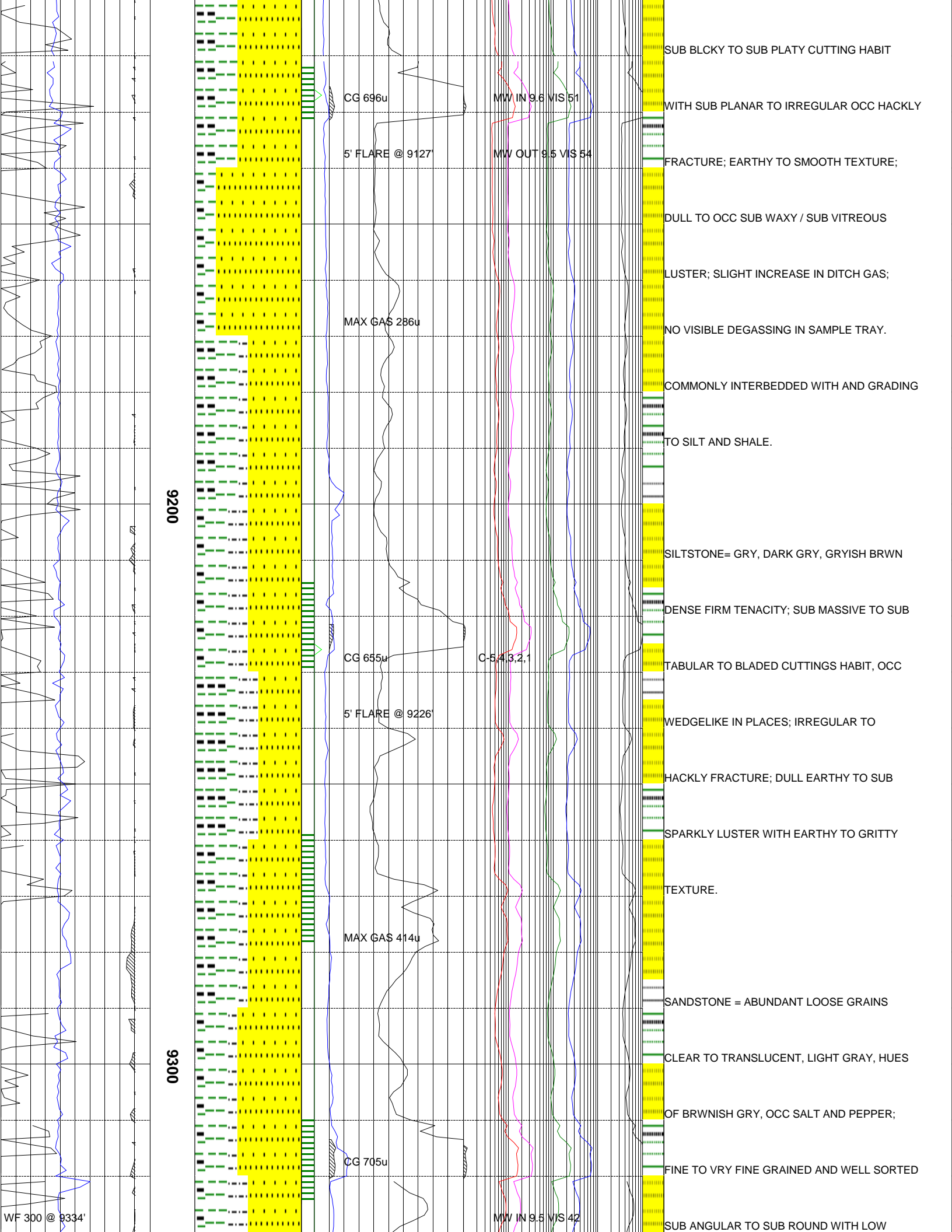












9200

9300

CG 696u

MW IN 9.6 VIS 51

5' FLARE @ 9127

MW OUT 9.5 VIS 54

MAX GAS 286u

CG 655u

C-543.2.1

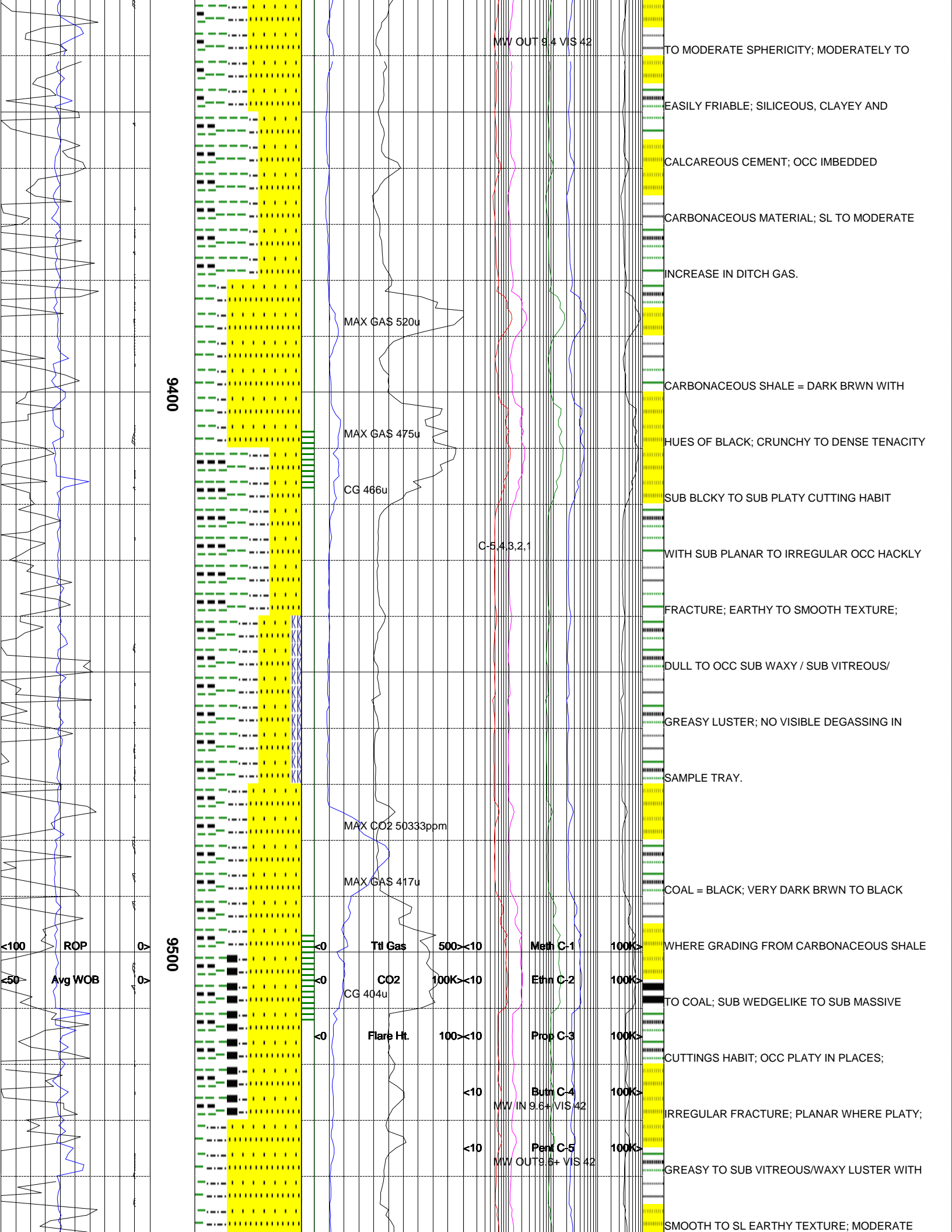
5' FLARE @ 9226

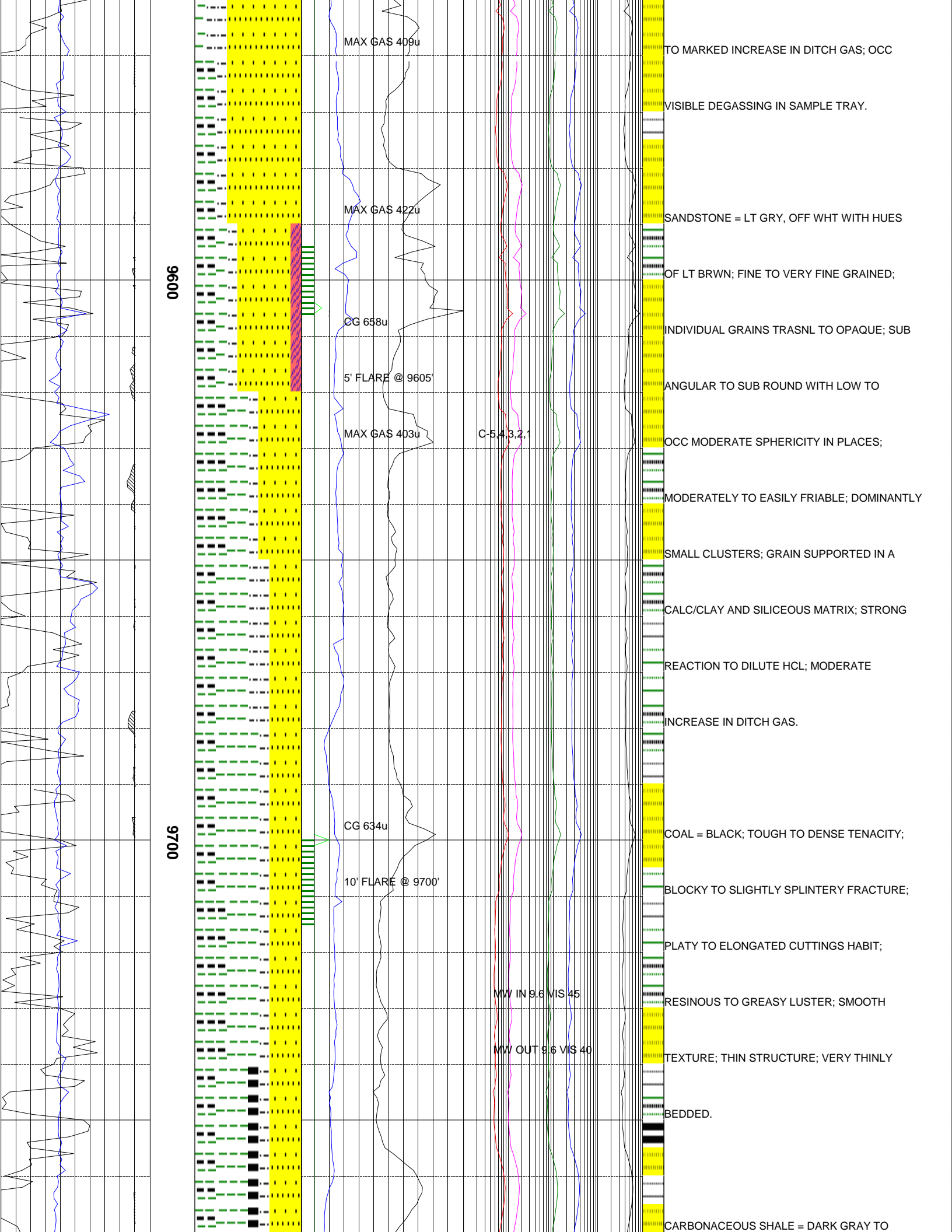
MAX GAS 414u

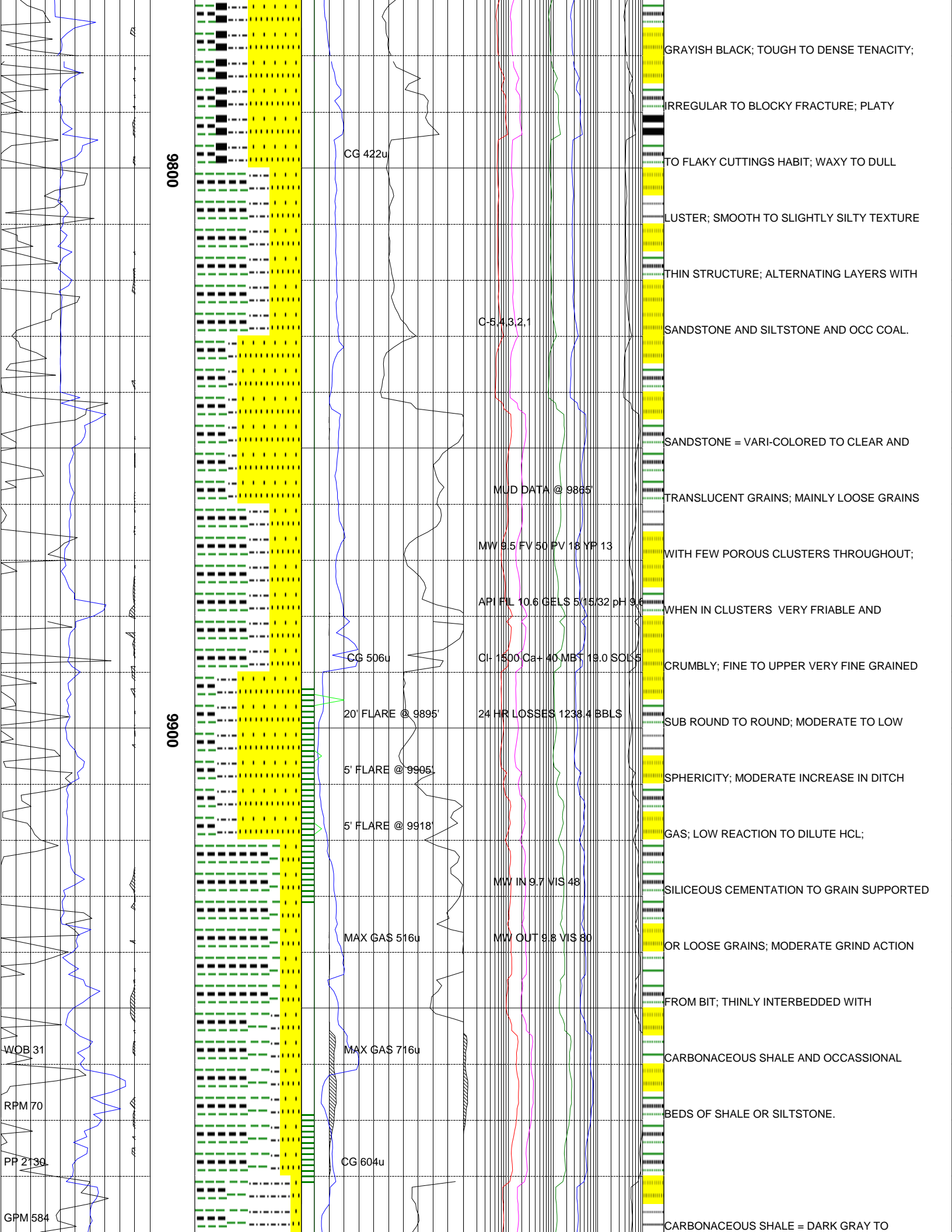
CG 705u

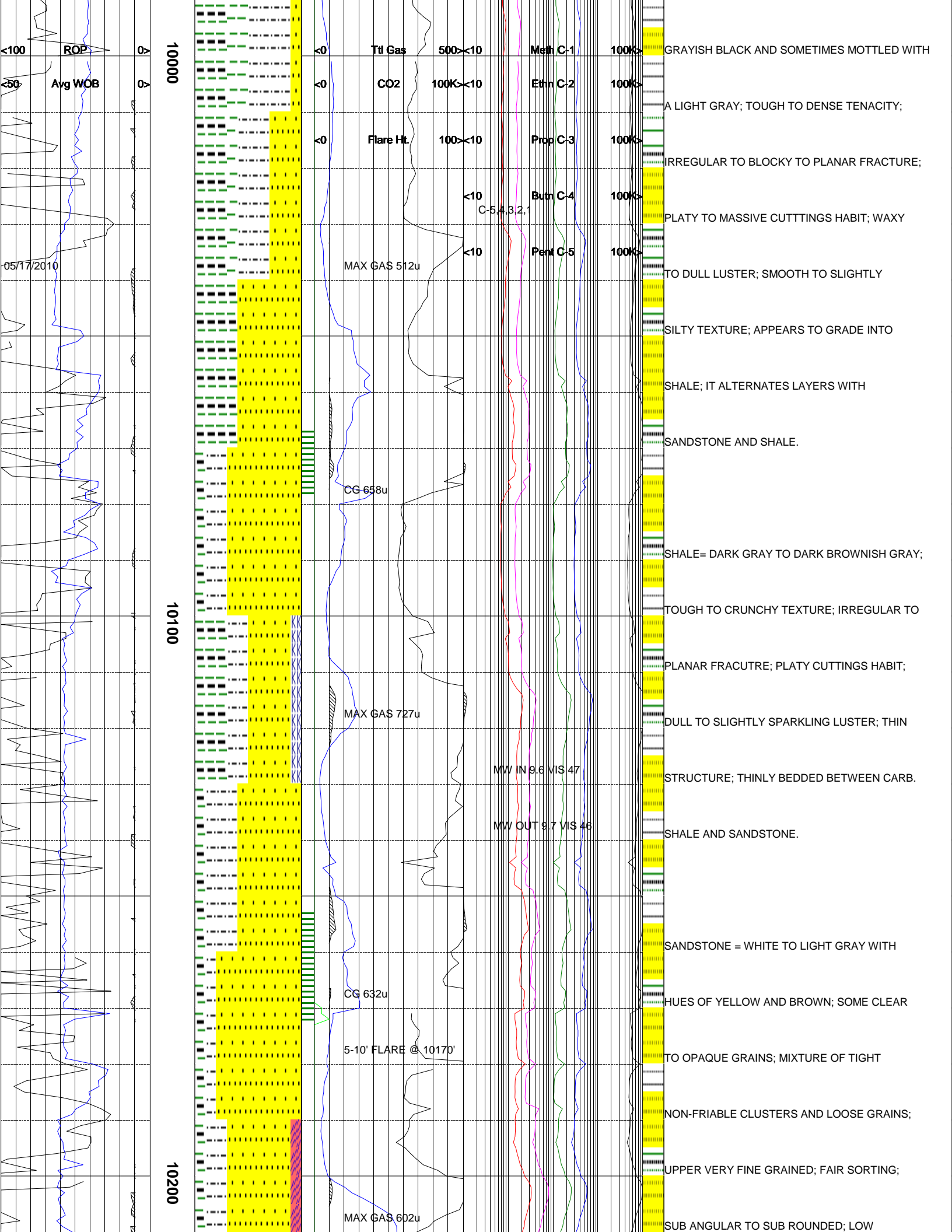
MW IN 9.5 VIS 42

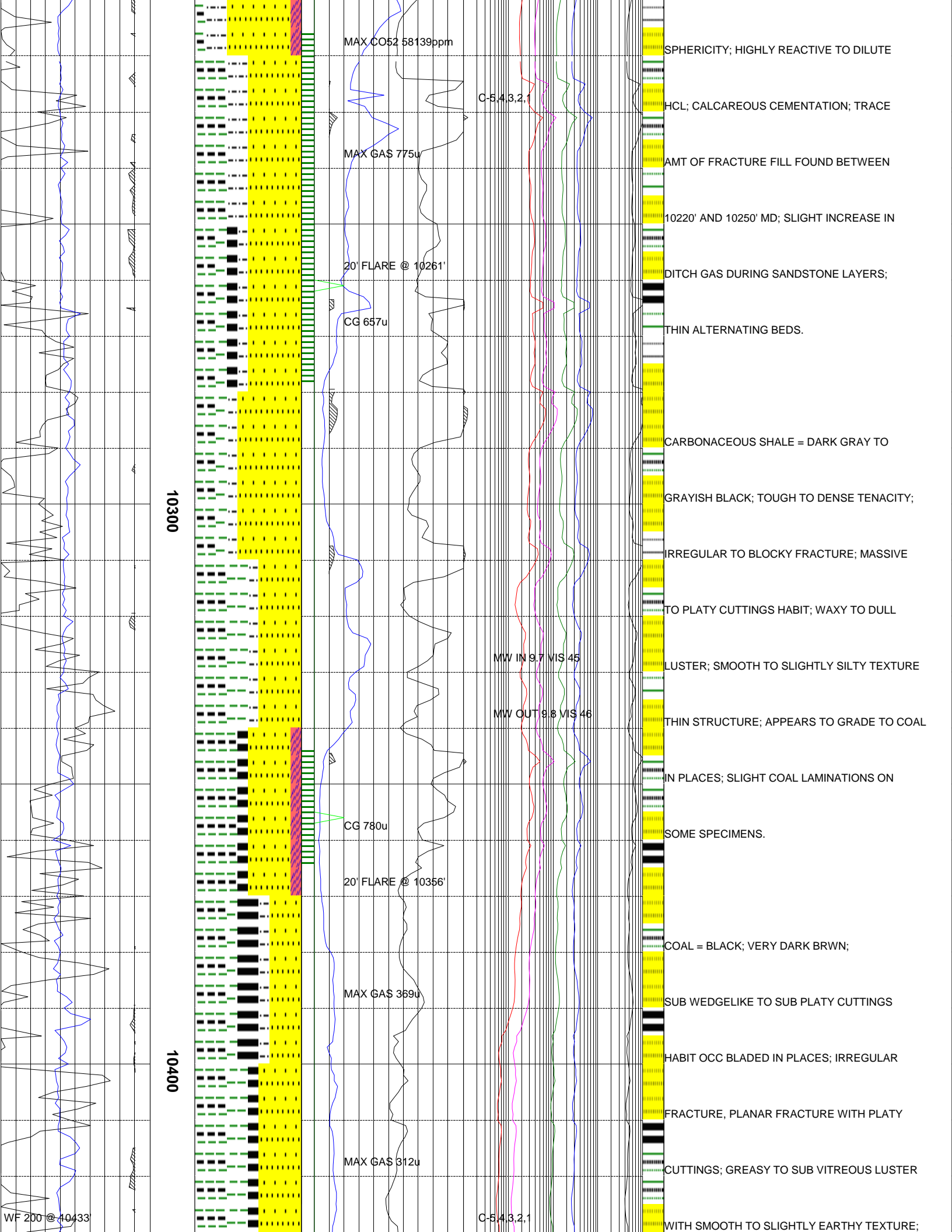
WF 300 @ 9334'











10300

10400

MAX CO2 58139ppm

MAX GAS 775u

20' FLARE @ 10261'

CG 657u

C-5443.2.1

MW IN 9.7 VIS 45

MW OUT 9.8 VIS 46

CG 780u

20' FLARE @ 10356'

MAX GAS 369u

MAX GAS 312u

C-5443.2.1

SPHERICITY; HIGHLY REACTIVE TO DILUTE

HCL; CALCAREOUS CEMENTATION; TRACE

AMT OF FRACTURE FILL FOUND BETWEEN

10220' AND 10250' MD; SLIGHT INCREASE IN

DITCH GAS DURING SANDSTONE LAYERS;

THIN ALTERNATING BEDS.

CARBONACEOUS SHALE = DARK GRAY TO

GRAYISH BLACK; TOUGH TO DENSE TENACITY;

IRREGULAR TO BLOCKY FRACTURE; MASSIVE

TO PLATY CUTTINGS HABIT; WAXY TO DULL

LUSTER; SMOOTH TO SLIGHTLY SILTY TEXTURE

THIN STRUCTURE; APPEARS TO GRADE TO COAL

IN PLACES; SLIGHT COAL LAMINATIONS ON

SOME SPECIMENS.

COAL = BLACK; VERY DARK BRWN;

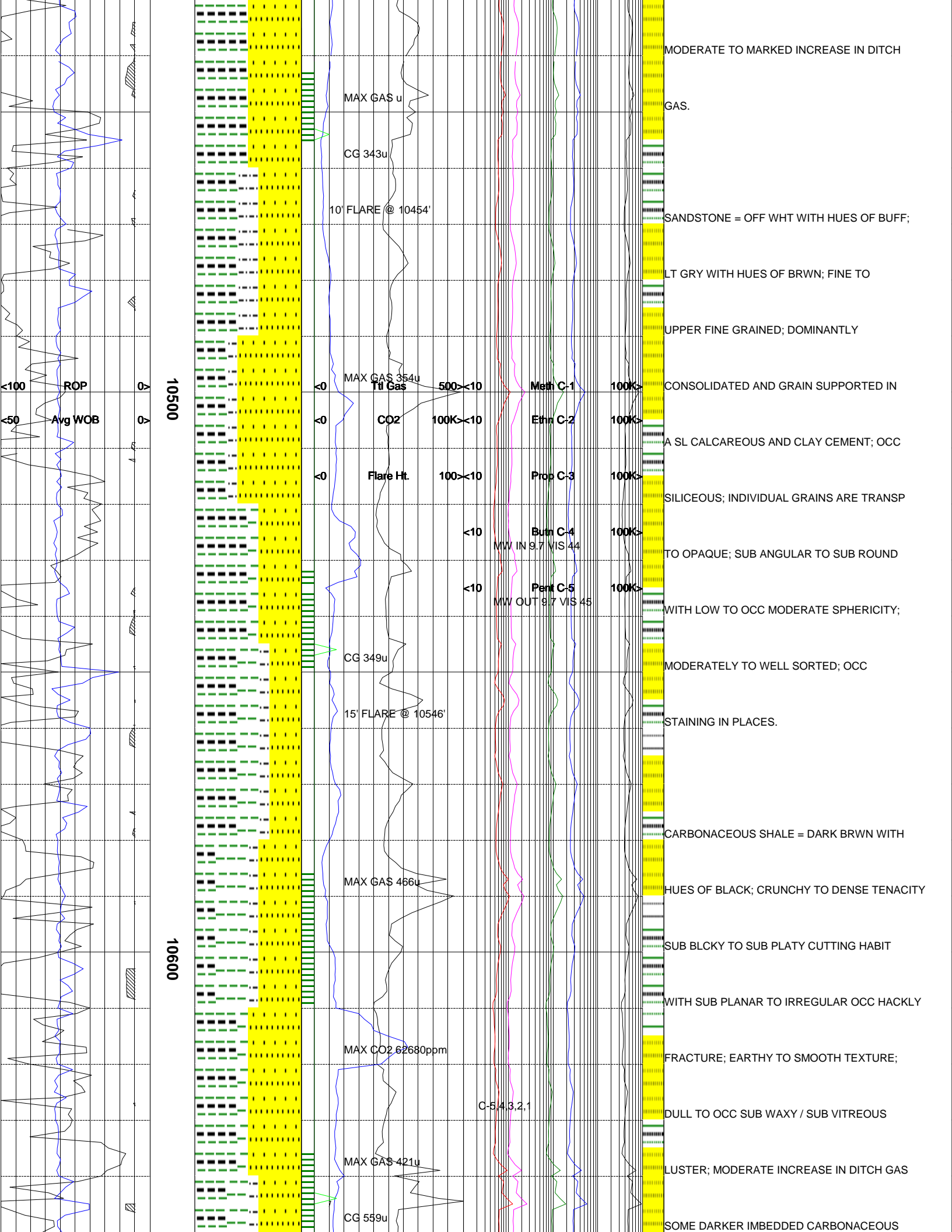
SUB WEDGELIKE TO SUB PLATY CUTTINGS

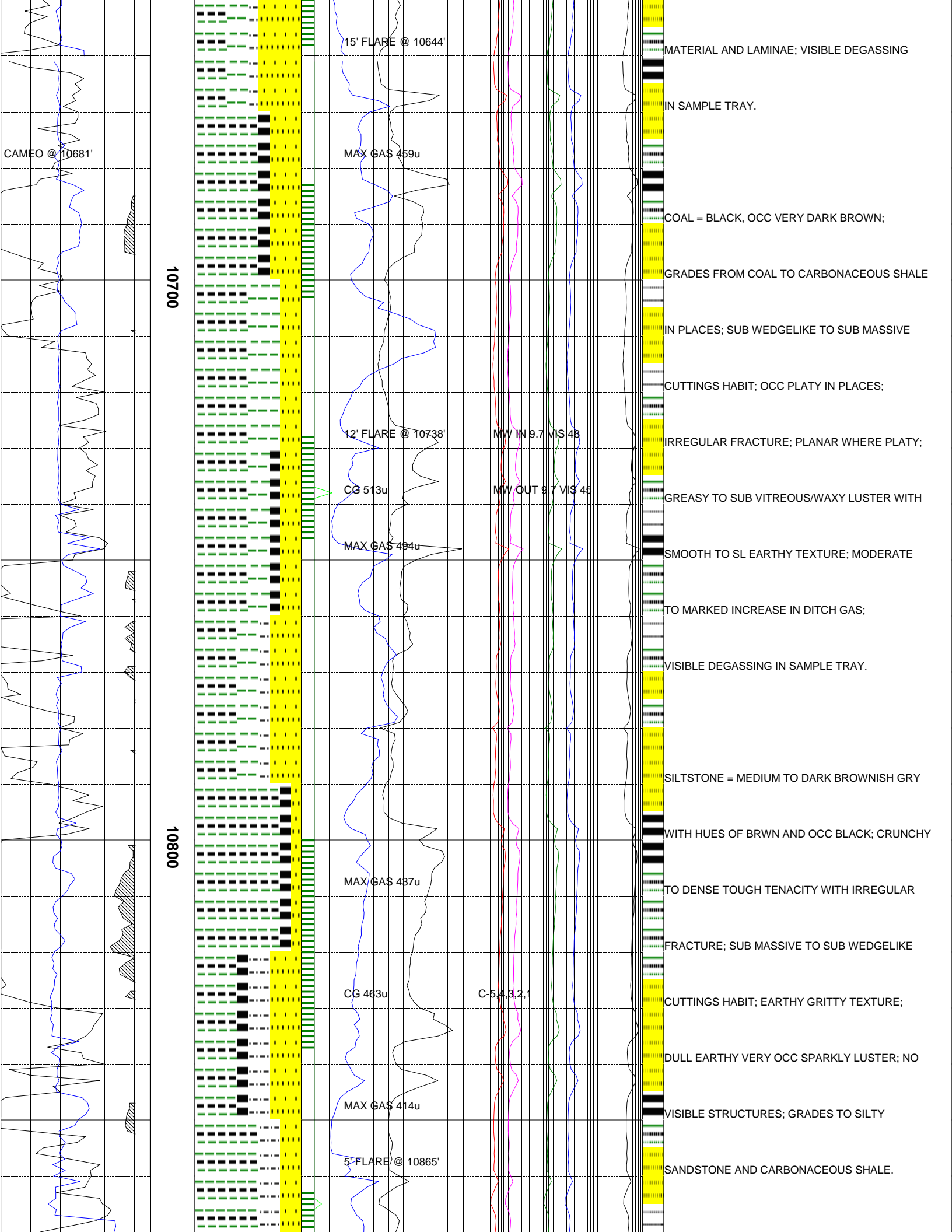
HABIT OCC BLADED IN PLACES; IRREGULAR

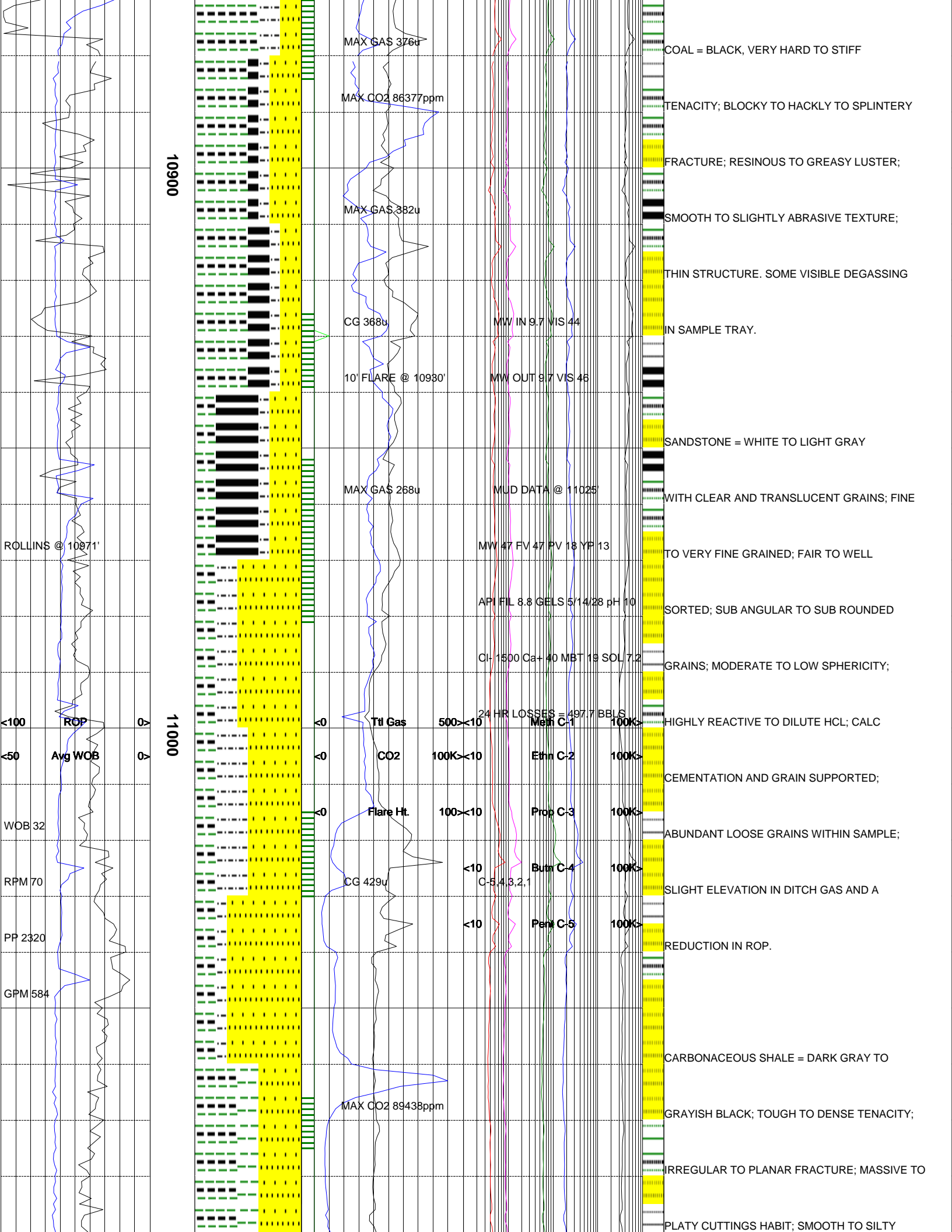
FRACTURE, PLANAR FRACTURE WITH PLATY

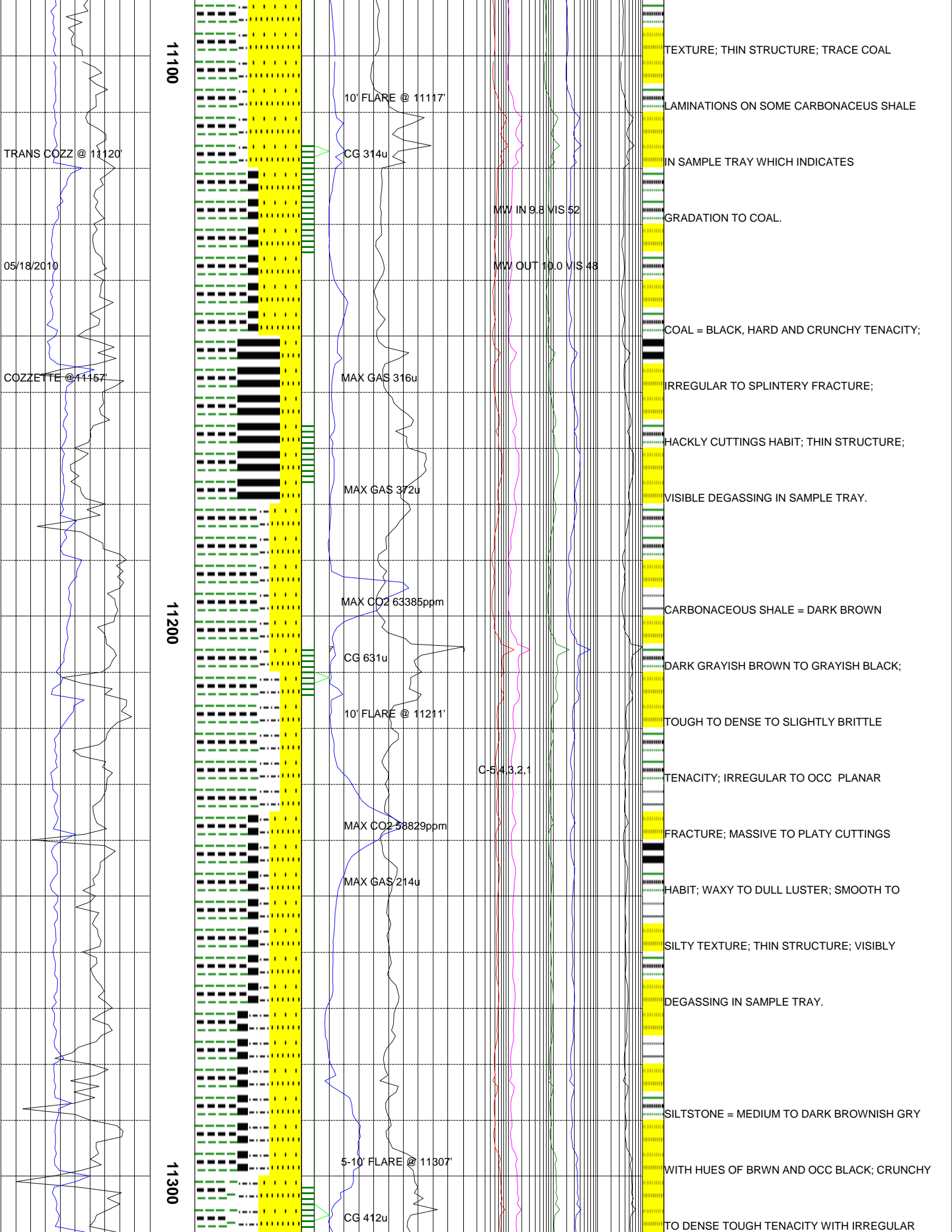
CUTTINGS; GREASY TO SUB VITREOUS LUSTER

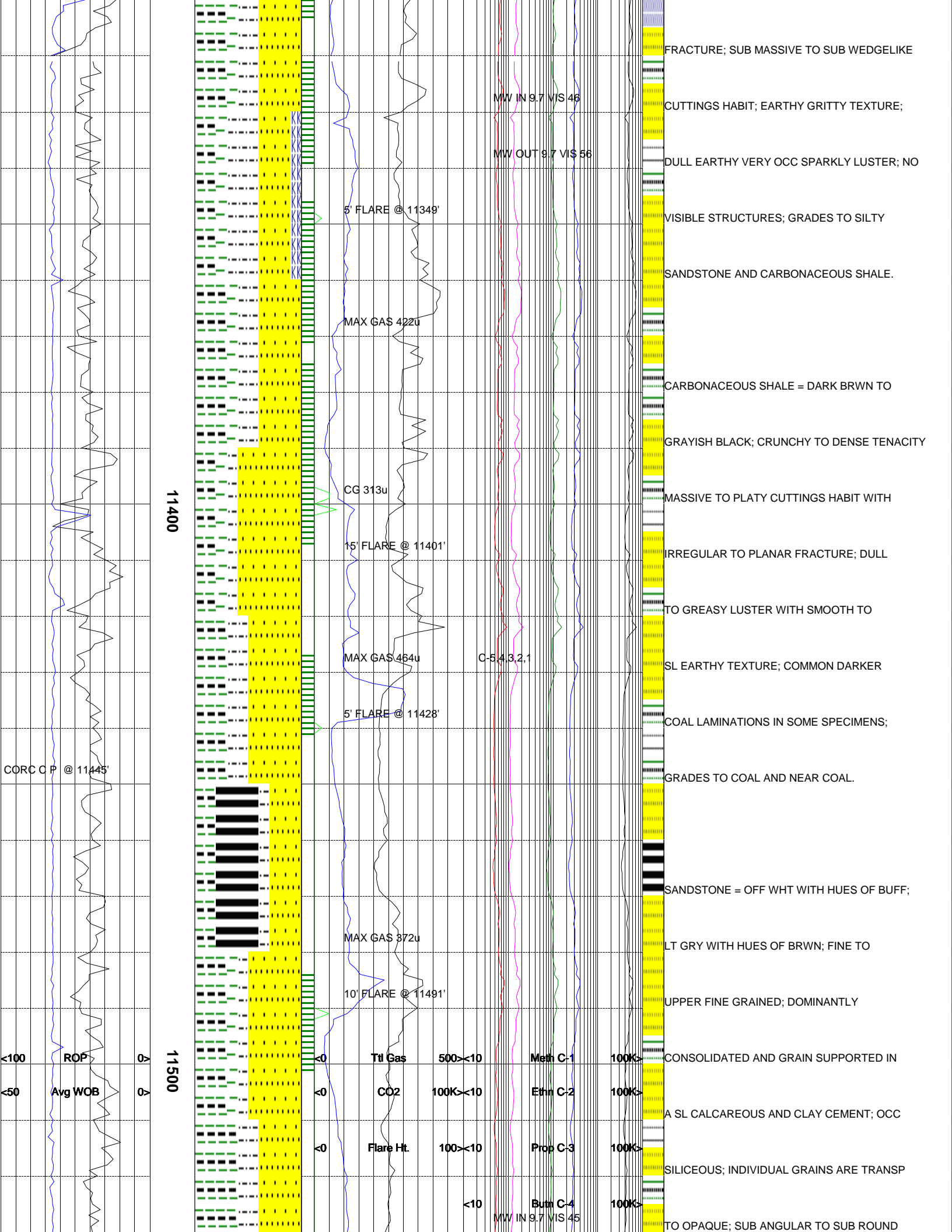
WITH SMOOTH TO SLIGHTLY EARTHY TEXTURE;

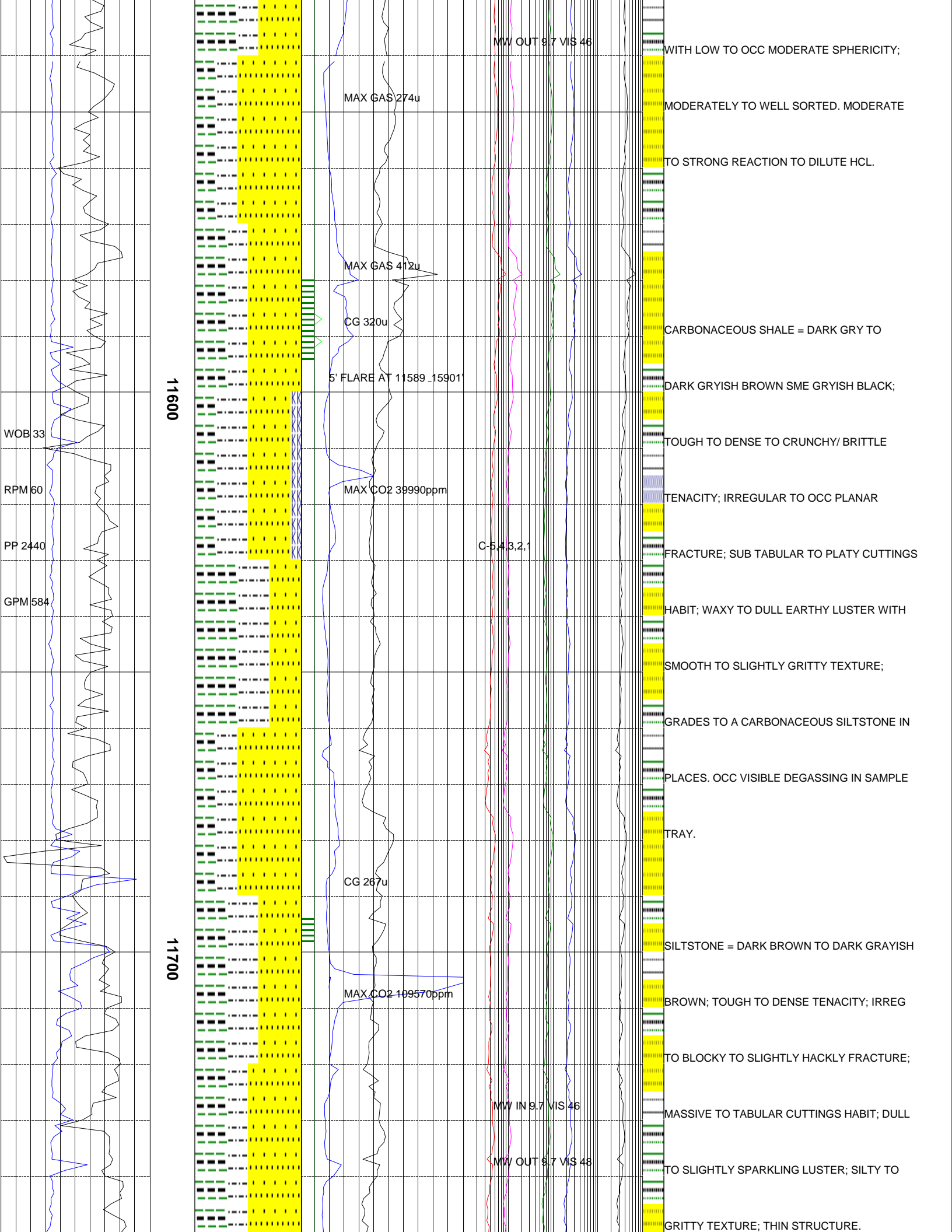


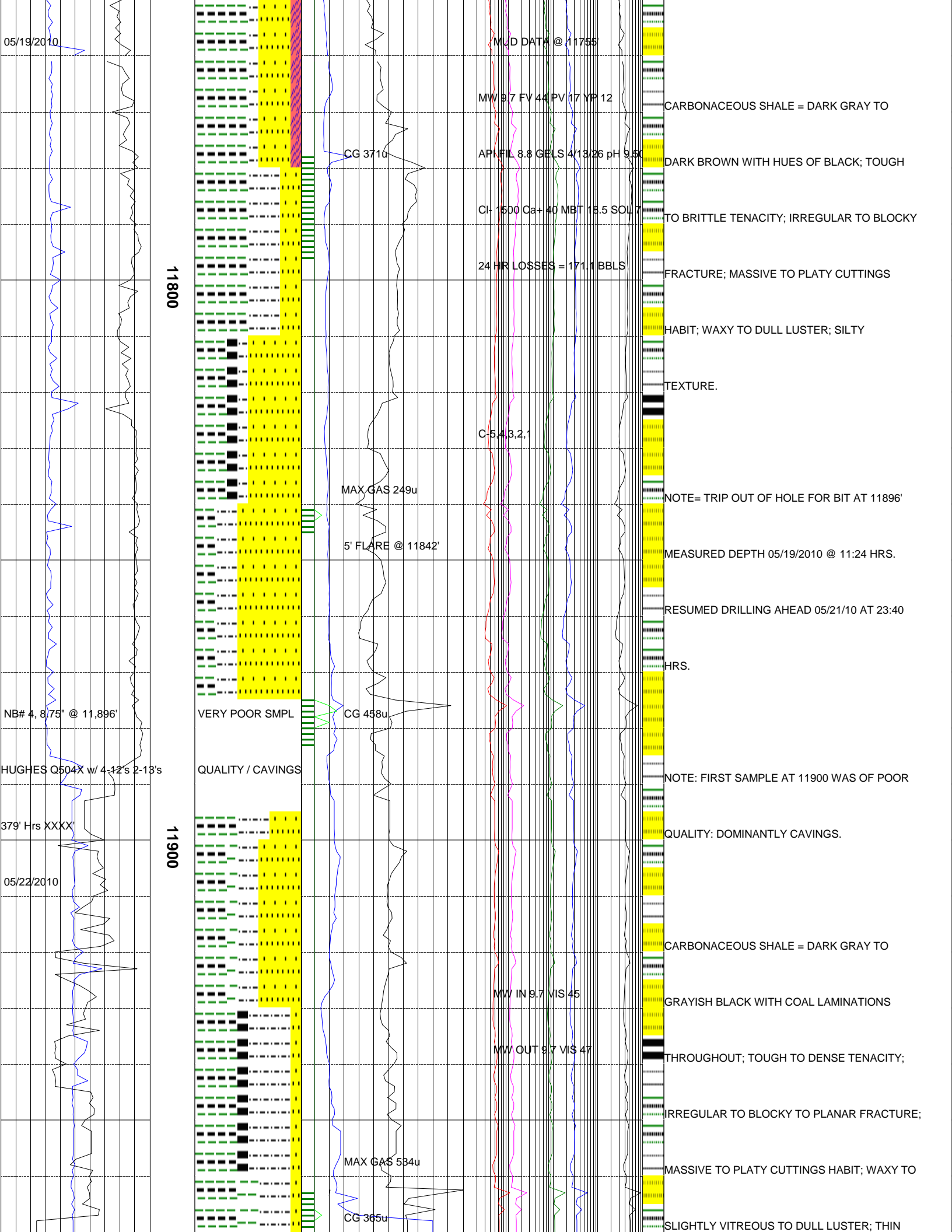


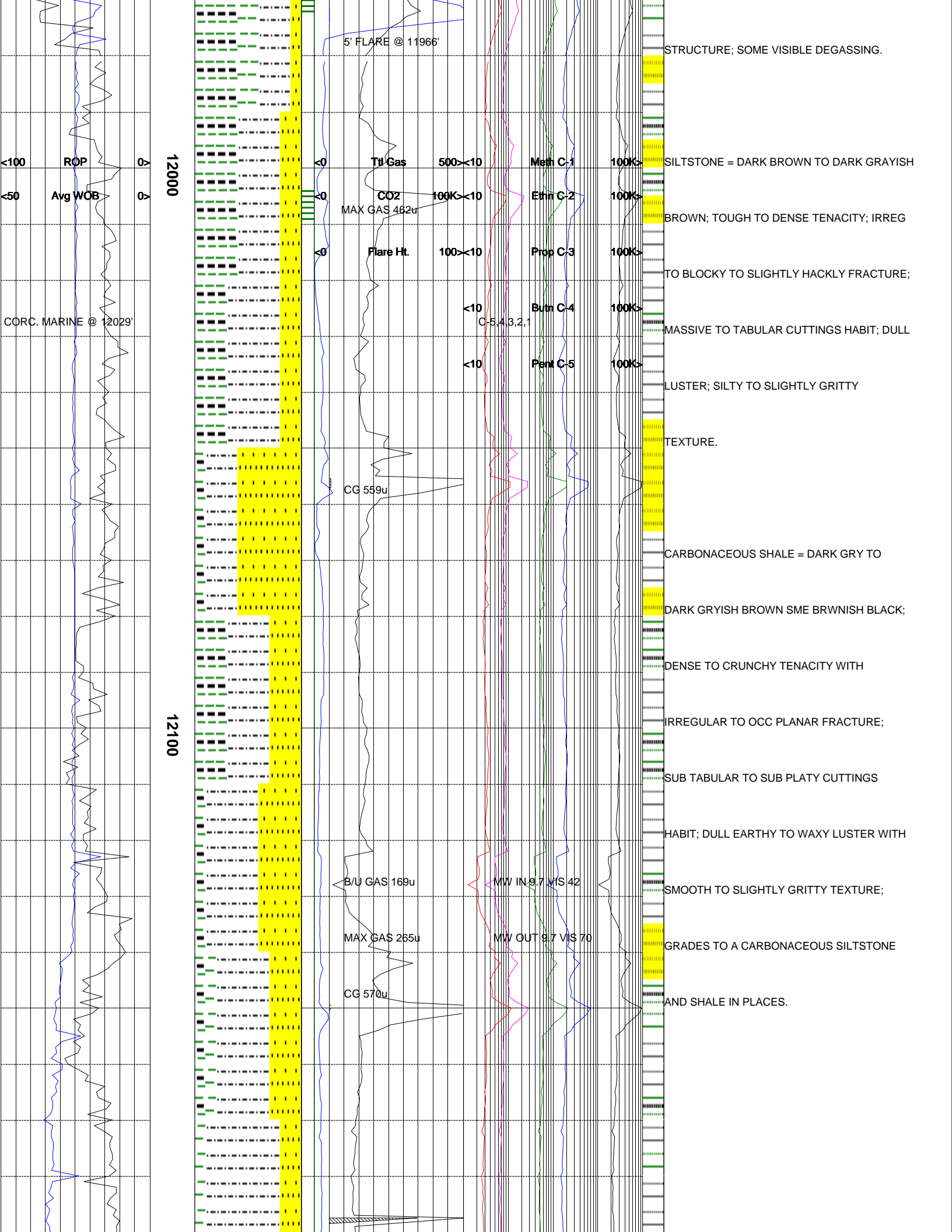












12200

NOTE = TOTAL DEPTH 12275' MD / 12251' TVD

REACHED 05/22/2010 AT 14:01HRS.

C-5.43.2.1

OFF BOTTOM GAS 370u

CG 396u

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